ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXI. No. 3389. NOVEMBER 6, 1942 6d. WEEKLY

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TECHNOLOGY DEPT.

REMEMBER

the men who are fighting to-day . . . at sea, on land and in the air. Thank them by helping to safeguard their future.

You can do this by sending a gift to help forward the work of the British Legion for ex-Service men and women of ALL Ranks and ALL Services, their families, and the dependants of those who fall in action.

Gifts should be sent to :—

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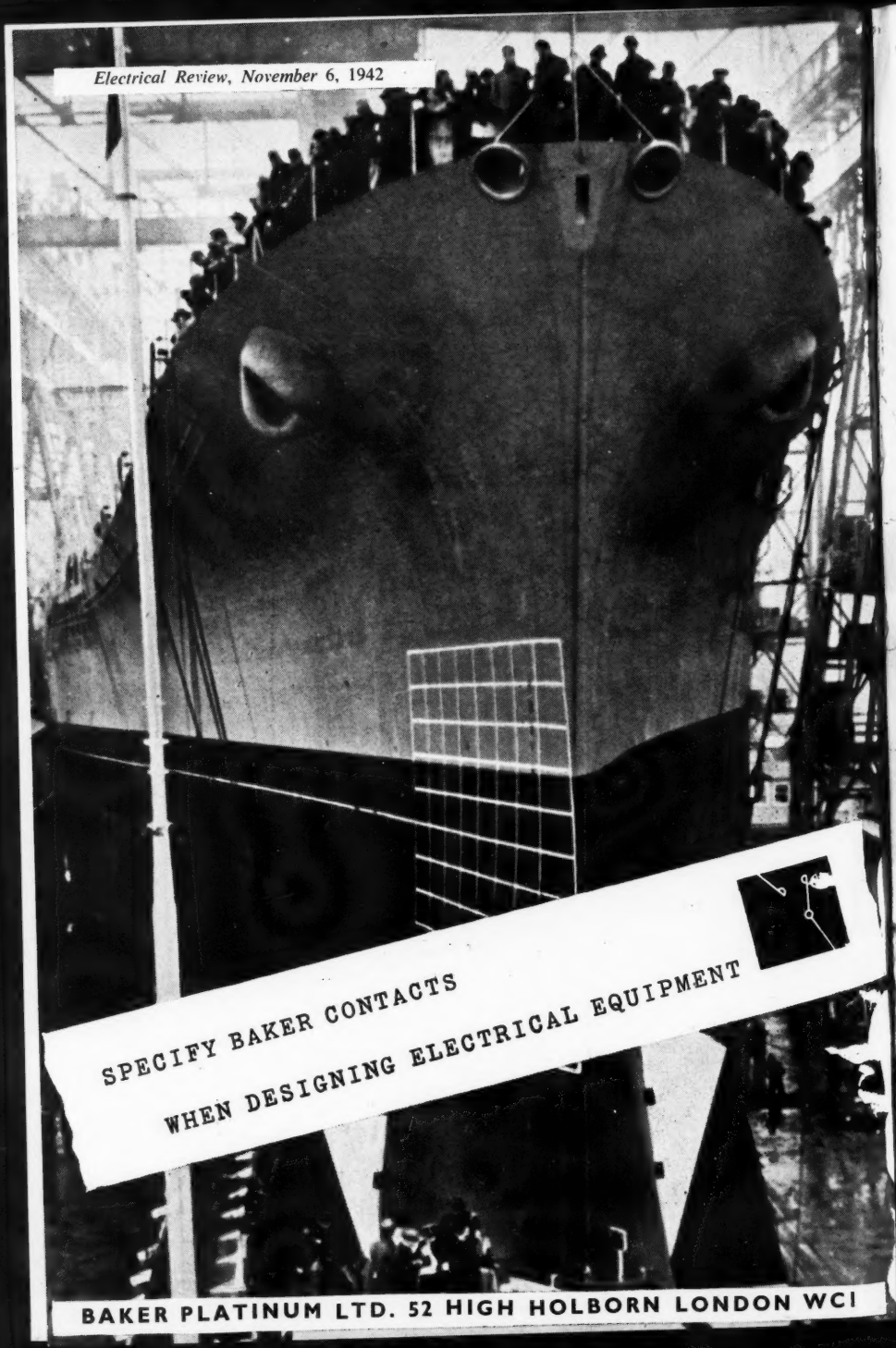
SPECIFY BAKER CONTACTS
WHEN DESIGNING ELECTRICAL EQUIPMENT
BAKER PLATINUM LTD. 52 HIGH HOLBORN LONDON WC1

HEATRAE

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Some of the greatest men who ever lived could express the most abstruse things in simple language.

So also does simple design in any mechanical apparatus best prove true genius.

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Sole Manufacturers of
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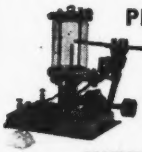

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Electric Welding Machines and Patent Scaling Machines.
Spot, Seam and Butt Welders.
"Westminster" Carbon Brush Holders.
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Dynamos, Motors, Alternators and Transformers Rewound and Re-constructed

Telephone : Willesden 1700, 1701
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Send for Prices and List of all kinds of Terminals

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to the specific requirements of our customers.

Makers of all types of repetition products from the bar in all metals.

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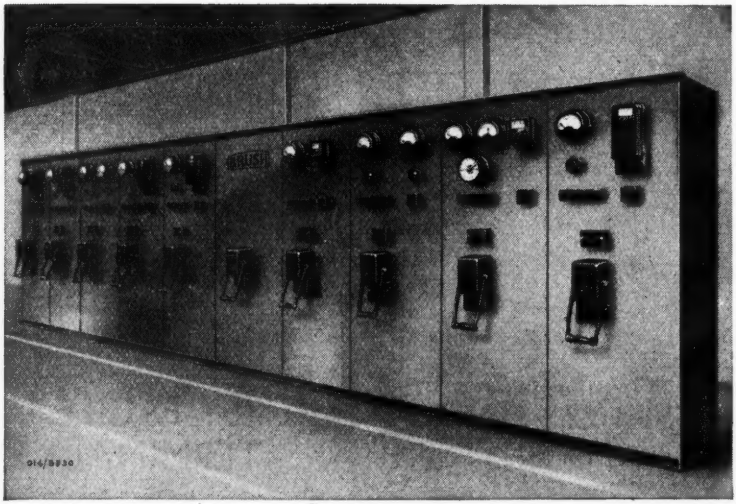

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RATINGS
up to
2,500 AMPERES
660 VOLTS

THIS type of equipment is designed for use chiefly in industrial sub-stations to control incoming bulk supplies and feeders to heavy plant and distribution gear.

- *NEAT and EFFICIENT DESIGN and LAYOUT*
- *ROBUST CONSTRUCTION*
- *UNRESTRICTED ACCESS*
- *SAFE OPERATION*

5-78

THE BRUSH ELECTRICAL ENGINEERING CO LTD
LOUGHBOROUGH ENGLAND

Because PREMIER is, for obvious reasons, severely restricted in the production of its own Fine-Quality, it presents some little gems of fine quality from the books of our day

"It'll do!"

My work in the theatre has taught me many lessons, but the most important is that only the best is good enough.

We all choose for ourselves certain rules of life, though we do not always keep them. We are all human, and often fail to reach the standards at which we aim. But the important thing is to aim high. I have always found that my most successful productions have been those with which I have aimed highest and taken most trouble. My failures have mostly been those of which I could not honestly say that they satisfied me.

The worst fault in the theatre is the tendency to slacken off just when one's most strenuous efforts are needed to ensure a satisfactory finish. "It'll do" is an evil phrase, far too common. It is a poisonous drug, and responsible for all the faulty work done in the home, the shop, the factory and the theatre.

From "COCK-A-DOODLE-DO" by Charles B. Cochran. (Reproduced by kind permission of the publishers, J. M. Dent & Sons Ltd.)

PREMIER *Fine-Quality*

electric heating appliances, including the famous "Laundwell" and "Smoothwell" electric irons; "Quickset" and "Pylon" electric kettles; electric fires; toasters; coffee percolators; multi-boilers, glue-pots and other appliances.

PREMIER ELECTRIC HEATERS LIMITED · BIRMINGHAM, 9

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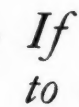

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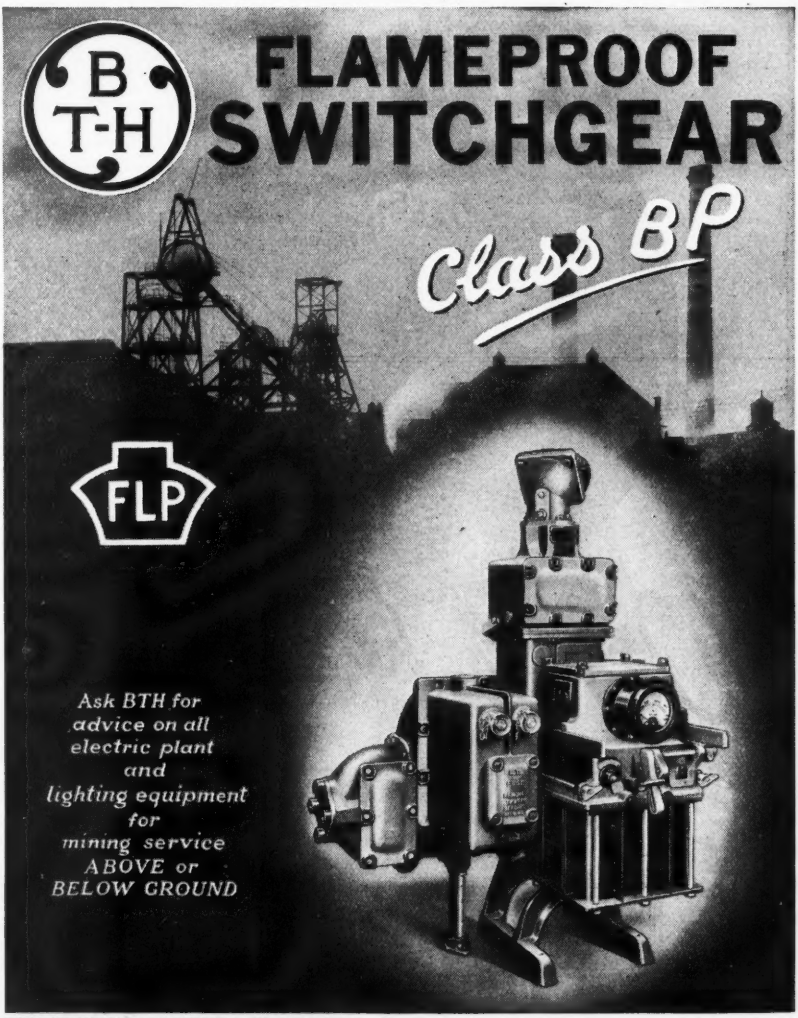

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AEI

NOV. 11
PLEASE GIVE GENEROUSLY
REMEMBRANCE DAY

PECULIAR PRATTLE

"Worth his Salt"

Those who have read "Treasure Island" may recall the words "It was plain from every line of his body that our new hand was worth his salt." In other words, he was reliable and able to pull his weight.

So, too, are our products worth their salt. B.R. Wire, Wire Ropes and Hemp Cordage are well known for their reliability. We supply them to every Industry and they do their work well.

BRITISH ROPES LIMITED

Head Office : DONCASTER. Sales Offices and Works throughout Great Britain.

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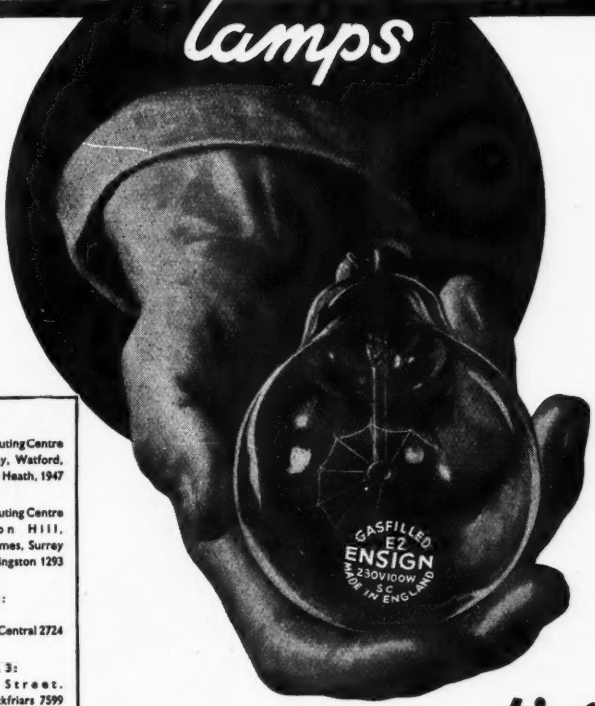

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SERVICE
FREEDOM
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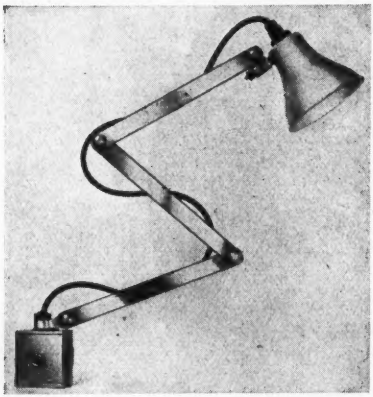
ENSIGN LAMPS LTD KENT STREET TEL. PRESTON 4628 PRESTON

MAXIMUM OUTPUT
DEPENDS ON
EFFICIENT LIGHTING



D & G GIRDER FITTINGS
FOR MACHINE TOOL AND BENCH LIGHTING

- Universal movement
- Concentration of light on the job
- Protects operators' eyes from glare
- Lower consumption
- Less lamp breakages

Made in Single-, Two- and Three-arm Extensions

Adopted by many of the Armament and other War Production firms

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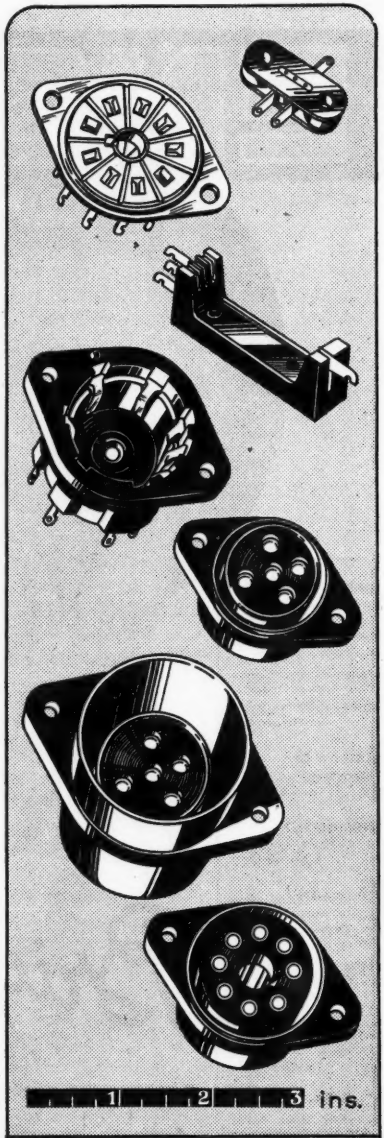

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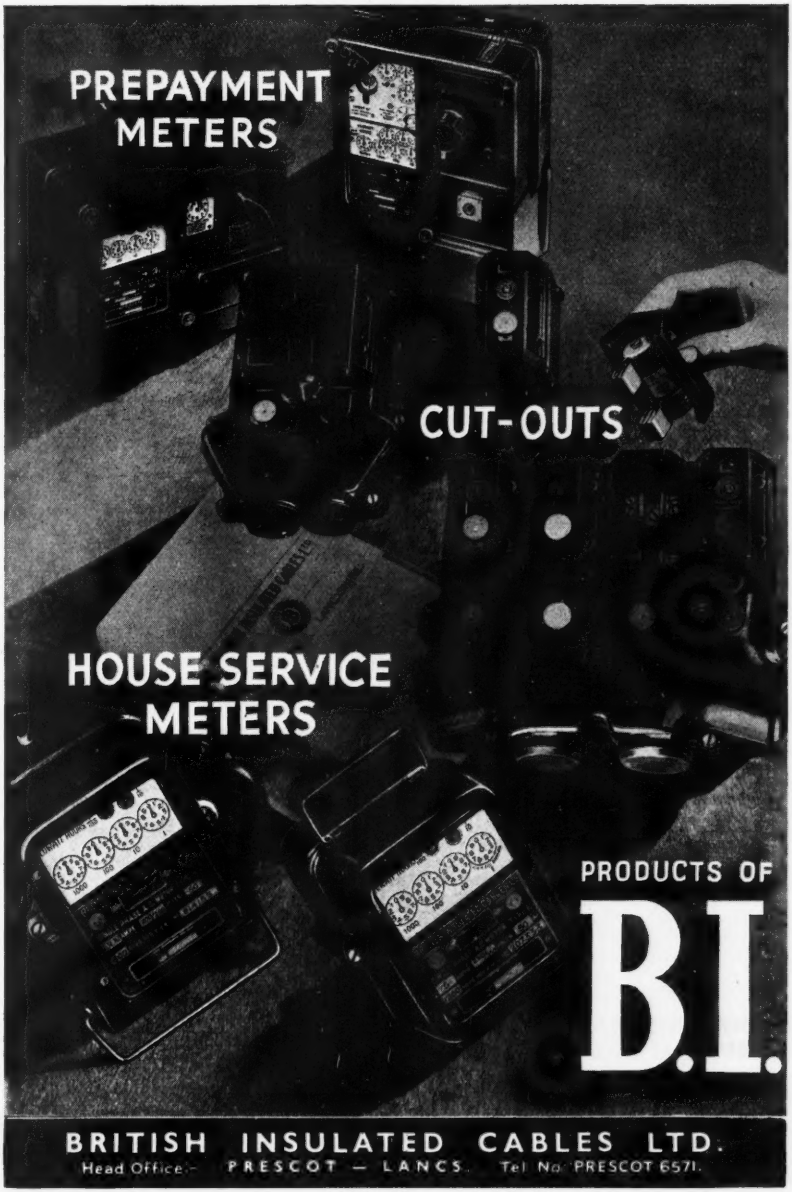
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PRODUCTS OF
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SAVES RUBBER!

"RELT" also saves weight . . . an important consideration with obvious implications in many industries to-day.

To instance one example, a ring shaped rubber distance piece when moulded in rubber weighed 1.20 ounces and contained 0.80 ounces of raw rubber. Moulded in "Relt", the weight was reduced to 0.46 ounces and the rubber content to 0.24 ounces.

THIS JOB ALONE SAVES 1¼ TONS OF RUBBER ON EVERY 100,000 MOULDINGS AND EVERY COMPONENT IS 61% LIGHTER UNDER THE "RELT" PROCESS.

This is but one example of the outstanding advantages of the "Relt" technique of moulding. The process has many other remarkable benefits . . . and it is an answer to the rubber shortage.

SEND YOUR ENQUIRIES FOR "RELT" MOULDINGS TO EMPIRE RUBBER CO., BUT MAKE SURE TO TELL US JUST WHAT YOUR COMPONENT HAS TO DO.

Our Complete Technical Service is at Your Disposal

EMPIRE RUBBER CO.
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Ferranti

Instruments

They ensure accurate and reliable measurement for the best utilisation of electrical supplies.

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FERRANTI LTD., Hollinwood, Lancs. *London Office: Bush House, Aldwych, W.C.2*

Remember

the men who are fighting today . . . at sea, on land and in the air. Thank them by helping to safeguard their future.

You can do this by sending a gift to help forward the work of the British Legion for ex-Service men and women of ALL Ranks and ALL Services, their families, and the dependants of those who fall in action.

Gifts should be sent to :—

HAIG'S FUND
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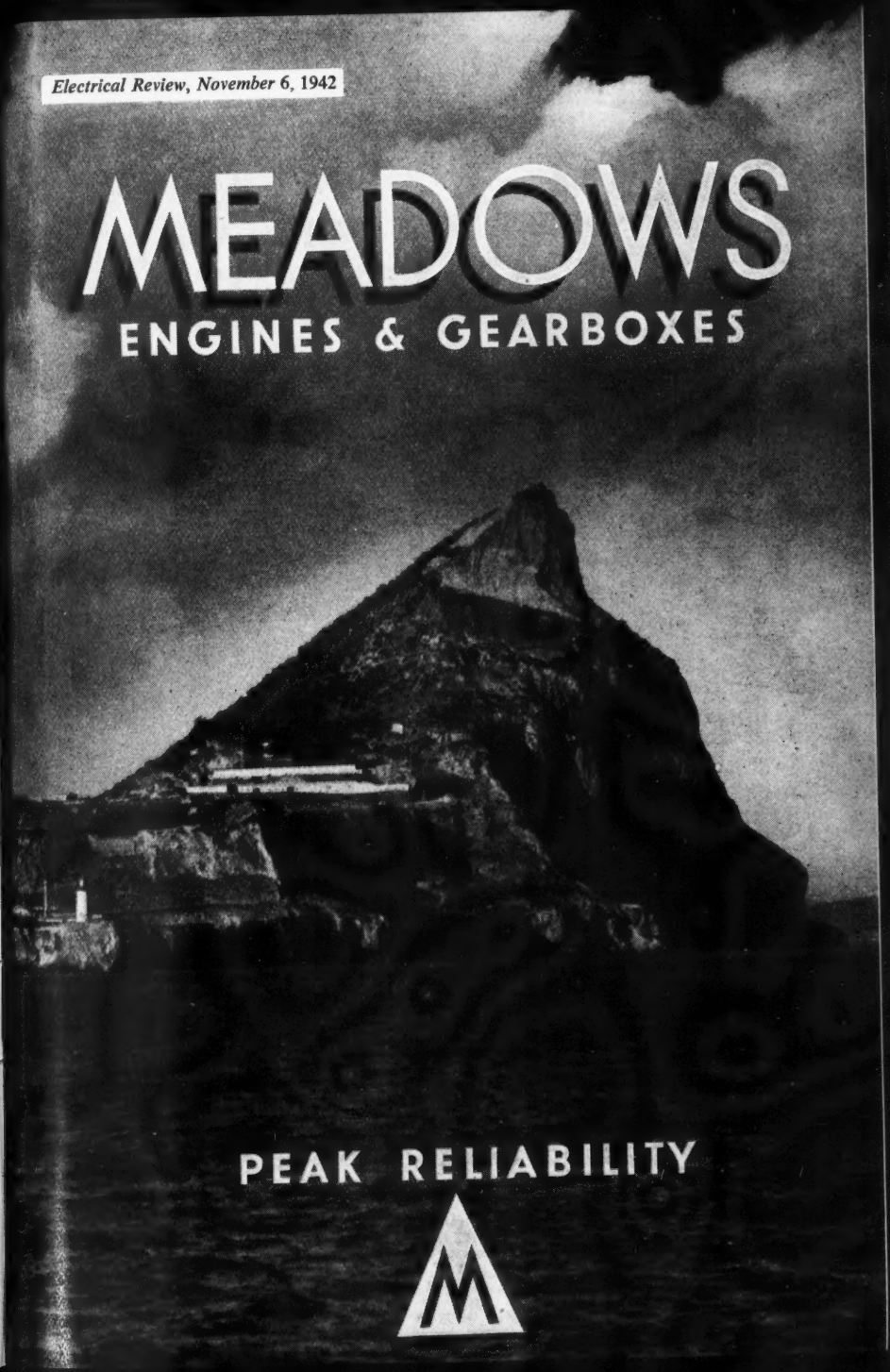
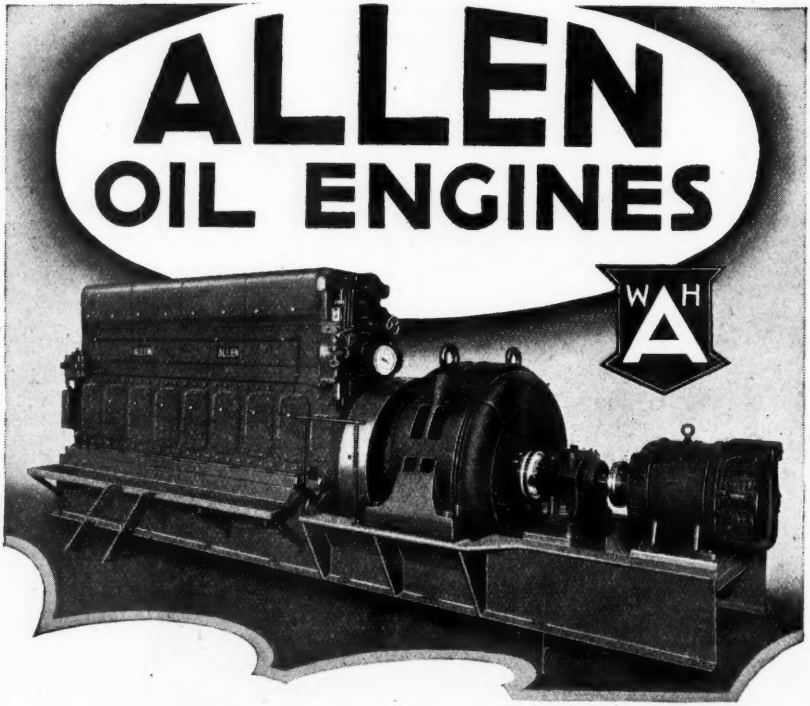
Surrey

Grateful thanks for the gift of this advertisement space are expressed to Metropolitan-Vickers Electrical Company Limited, makers of Cosmos and Metrovick Lamps.

Electrical Review, November 6, 1942



ALLEN
OIL ENGINES



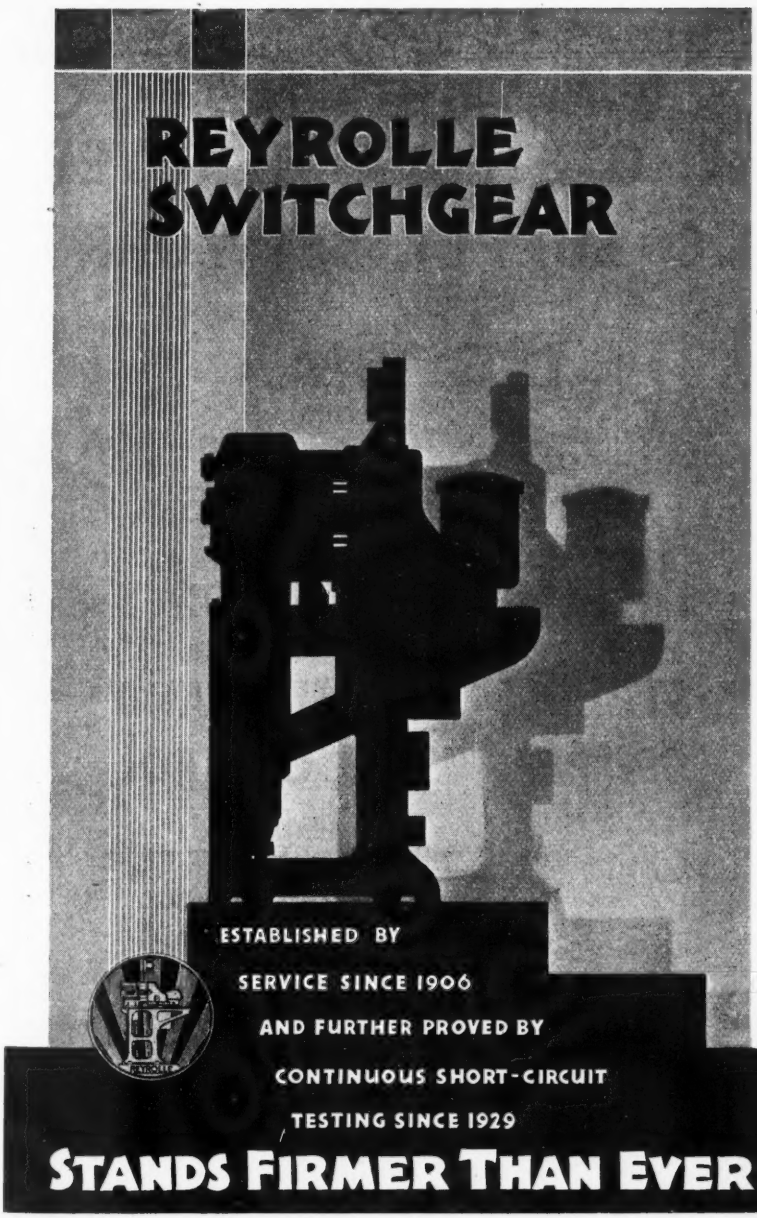
UNINTERRUPTED POWER SUPPLY

IN all cases where the continuity of electric supply is vital to the work being carried out, automatic-starting standby plant is essential. The illustration above shows a 250-kW generating set which can be arranged to provide an alternative power supply automatically.

The system of automatic starting employed on Allen oil engines does not rely upon an independent electric supply for its operation.

Allen type S.30-B engines are providing reliable power in practically every branch of industry and public service in many parts of the world.

W. H. ALLEN, SONS & CO., LTD., BEDFORD, ENGLAND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ESTABLISHED BY
SERVICE SINCE 1906
AND FURTHER PROVED BY
CONTINUOUS SHORT-CIRCUIT
TESTING SINCE 1929
STANDS FIRMER THAN EVER

REMOTE CONTROL OVER A.C. SUPPLY NETWORKS

D.C. BIAS

FOR

A.R.P. SERVICES

LAST MINUTE WARNINGS

STREET LIGHTING AND OFF PEAK LOAD CONTROL

OUR Engineers will be glad to place their experience at your disposal. Illustrated literature will be gladly sent to principals upon request.

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LAMPS
REMEMBRANCE DAY
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HOME
ON
NATIONAL
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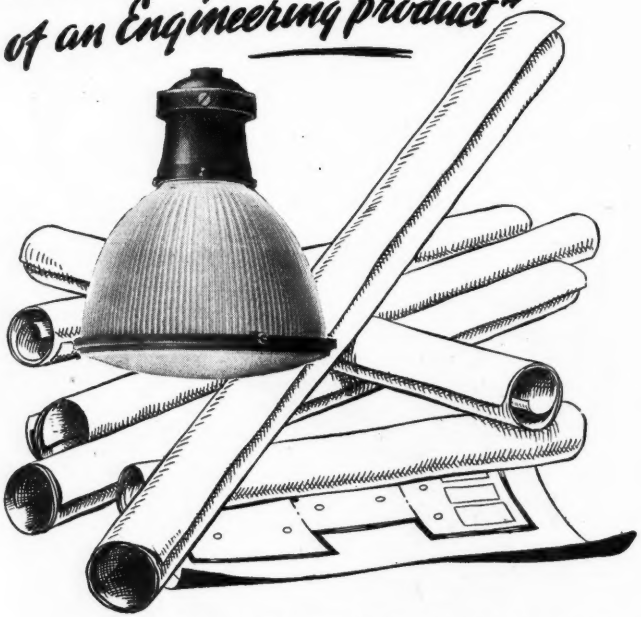
"Engineering Application of an Engineering product"



HOLOPHANE TRANSLUCENT INDUSTRIAL REFLECTORS

Owing to their scientific design these units direct some 75% of the light downwards and, in addition, allow a further 20% to pass upwards to illuminate the ceiling. They are available in the enclosed type shown here and in a range of open reflectors of three types : Extensive (2 : 1) Intensive (1½ : 1) and Focussing (1 : 1). Besides making efficient reflectors Holophane Engineers are at your service to plan the lighting for any factory.

HOLOPHANE

LIMITED.

ELVERTON STREET, LONDON, S.W.1.

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TRADE
HIGGS MOTORS
GOVERNING DIRECTOR WALTER F. HIGGS, M.I.E.E. LTD.
MARK
BIRMINGHAM, 6 ENGLAND

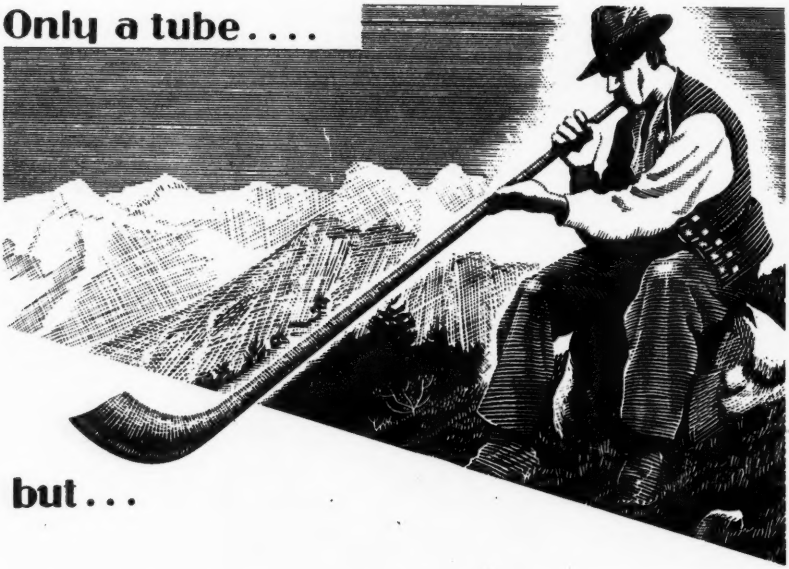
FORESIGHT

How easy it is to be wise after the event; in these vital hours of maximum production, so much depends on your motor and breakdowns of any description must be avoided.

If you look for a unit to run continuously under the most adverse conditions—then be wise and specify Higgs Totally Enclosed Fan Cooled Motors.

Birmingham, Bristol, Dundee, Glasgow, London, Manchester, Nottingham, Peterborough, Sheffield, Wolverhampton.

Only a tube....

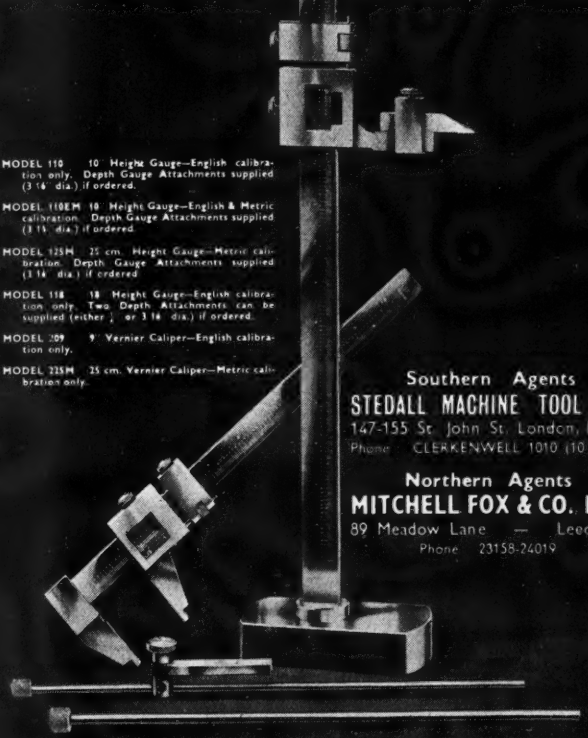


but...

the indispensable adjunct whereby the Farm-hand in the Alps calls home at milking time his cows scattered in the pastures of the Mountains.

It is his means of communication with them—just as "Walsall" Conduit provides the safe means of communication for light, heat and power in all parts of both old and new buildings.

PERFECTION MEASURING INSTRUMENTS



MODEL 110 10" Height Gauge—English calibration only. Depth Gauge Attachments supplied (3/16" dia.) if ordered.

MODEL 110EM 10" Height Gauge—English & Metric calibration. Depth Gauge Attachments supplied (3/16" dia.) if ordered.

MODEL 125M 25 cm. Height Gauge—Metric calibration. Depth Gauge Attachments supplied (3/16" dia.) if ordered.

MODEL 118 18" Height Gauge—English calibration only. Two Depth Attachments can be supplied (either ⅛" or 3/16" dia.) if ordered.

MODEL 209 9" Vernier Caliper—English calibration only.

MODEL 225M 25 cm. Vernier Caliper—Metric calibration only.

Southern Agents
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Phone CLERKENWELL 1010 (10 lines)

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MITCHELL FOX & CO. LTD
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Phone 23158-24019

BRITISH N.S.F. CO. LTD.
ALL ENQUIRIES TO OUR AGENTS

KEYS TO L.D.C. "LASTING RELIABILITY"...

WHAT IS MICA?

Mica is a silicate of Alumina : a mineral ore of crystal formation and it is obtained mainly from mines in India, Canada and Africa.

Because of its hardness, transparency and heat resisting properties, mica is used for a variety of purposes. Most of us know its application in the door or front of Anthracite stoves, and in contrast to this familiar form it is odd to note that the Chinese reduce mica to powder and then take it as a medicine, believing that it prolongs life. The ancient Romans also used powdered mica to give a glistening effect to their arena floors.

To-day, the principal uses of mica are to be found in the electrical industry, where advantage is taken of its high insulating properties.

Therefore, as mica is flexible only when split into very thin laminae, in the electrical industry it is generally used in the form of Micanite, which is made from splittings—films a mere thousandth of an inch thick. This "splitting" cannot be economically effected by machine and consequently done by hand. Some little Indian children mainly because

A COMPARISON OF VARIOUS INSULATING MATERIALS

MATERIAL	AVERAGE BREAKDOWN VOLTAGE			
	Thickness	At 20° C.	At 100° C.	Increase or decrease when heated from 20° C. to 100° C.
MICA	1/1000"	VOLTS 30,000	VOLTS 30,000	NIL
Synthetic Resin Insulating Materials	1/10"	30,000	17,000	- 43·3%
MICA PRODUCTS including Micanite, paper and cloth sheet with mica splittings	1/10"	30,000	31,000	+ 3·3%
Layers of paper stuck together with a varnish	1/10"	27,000	7,000	
VARNISHES				

INSULATION

Mica is extensively used in L.D.C. Motors because it possesses insulating properties to a greater degree than any other known substance.

The above are extracts from *"The Foundation of Insulation is MICA"*

The use of inferior insulating materials in motors results in an annual loss from insulation failures of more than £1,000,000 (*vide B.E.A. Report*). **The generous use of Mica in L.D.C. Motors prevents such loss and ensures the reliability for which L.D.C. machines are world-famous.**

An interesting booklet, "The Foundation of Insulation is MICA" (illustrated above), was first published in 1938. A few copies are still available on request from L.D.C. Ltd., Publicity Dept., 94 Petty France, London, S.W.1.

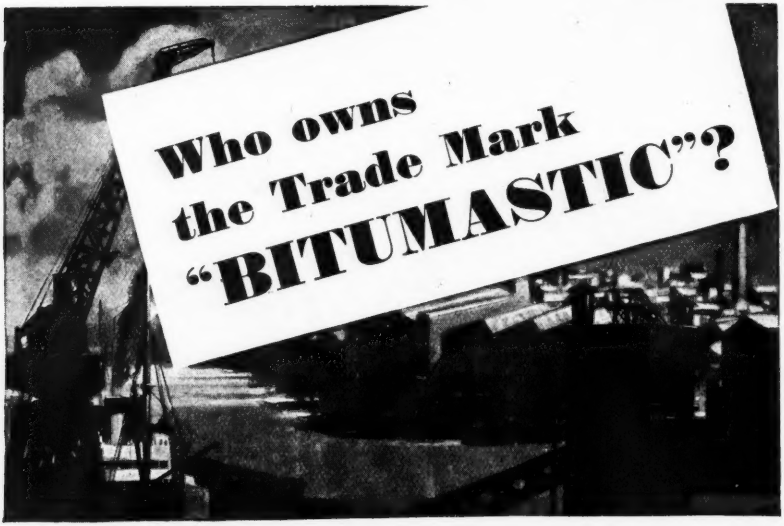
LANCASHIRE DYNAMO & CRYPTO LTD

TRAFFORD PARK, MANCHESTER, 17. WILLESDEN, LONDON, N.W.10.

MANUFACTURERS OF ELECTRIC MOTORS SINCE 1899

Associated Companies :- FOSTER TRANSFORMERS & SWITCHGEAR LTD., SOUTH WIMBLEDON, S.W.19. • CRYPTON EQUIPMENT LTD., WILLESDEN, N.W.10.

Cambric Insulated Cables
are another type
for which good service
can be obtained at
The Liverpool Electric Cable Co. Ltd
of Bootle, Liverpool, 20.



The name "BITUMASTIC" is frequently employed as a general term to indicate any product of a bituminous character; but this quite incorrect and *illegal* use of the name does not imbue those products with the "Bitumastic" quality.

"BITUMASTIC" is a Trade Mark name, the exclusive property of Wailes Dove Bitumastic Ltd., and only applies to products manufactured by them. Behind these products is 88 years' experience in protecting Marine and Industrial Structures, Plant and Equipment from Corrosion, Rot and Decay, and the name itself is a guarantee of an effectiveness and longevity that has been proved by evidence from all quarters of the globe.

The services of our Advisory Department are always available free of charge. Send particulars of your corrosion problems to Dept. L.3.

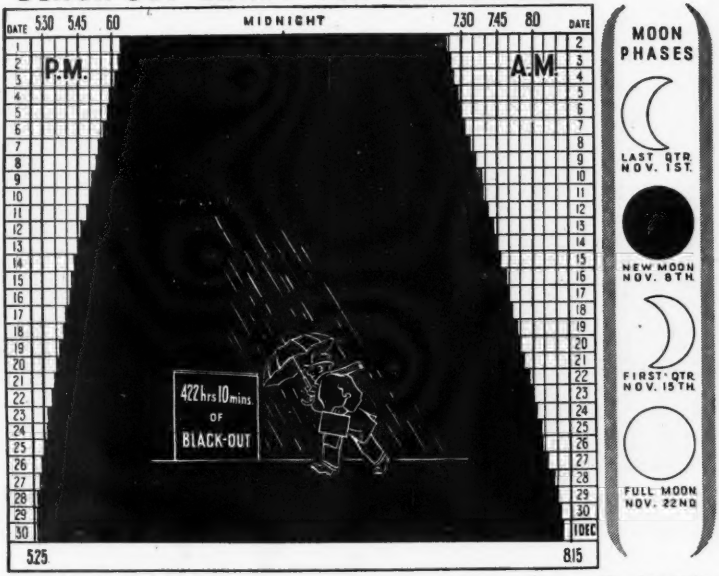
WAILES DOVE
BITUMASTIC★LTD
The People who Defeat Corrosion

HEBBURN • COUNTY DURHAM •

GD91/3

Will it be a hard winter?

BLACK-OUT CHART FOR NOVEMBER



Reproduced from the Nautical Almanac by permission of the Controller of H.M. Stationery Office.

★ *Times shown are those for the London area.*

It cannot be forecast how much snow or frost, rain or fog will be our portion this winter. Whether it be a "hard" winter or not, black-out conditions in works and factories will still make hard going for the maintenance and increase of output. Make sure, then, that good lighting prevails everywhere—make sure by fitting Osram lamps that once again they may play their part in creating a bright, stimulating atmosphere for every kind of work.

Osram

A G.E.C. PRODUCT

THE WONDERFUL LAMP

Advt. of The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2

NATIONAL EMERGENCY *lease assist by saving all packing material for collection when our van calls.*

COIL WINDING MACHINES

TAPING MACHINES

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ARMATURE AND STATOR

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Contractors to
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Please address all enquiries to Western Office:
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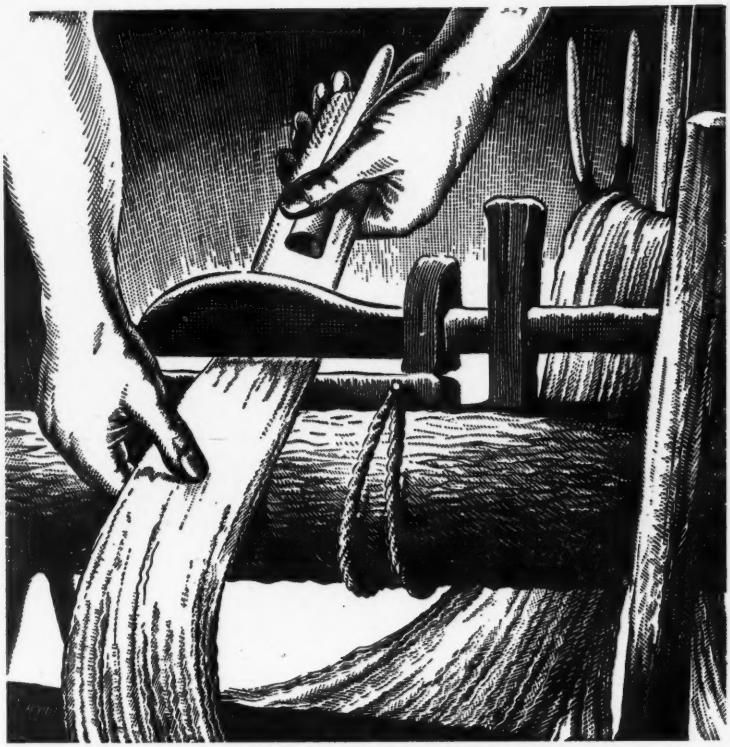

stripped water

In preparing flax and hemp for ropes it is first stripped from its stem, slit into lengths and scraped through a bamboo instrument until only clean fibre remains. This extensive preparation of stripping, slitting and scraping is essential to produce a first-class quality fibre.

The stripping of water of its scale-forming and soluble salts for use as boiler feed is effected by the Permutit "Deminrolit" Process which, not only obtains the results without the use of heat or steam, but also eliminates ammonia and corrosion of condensers.

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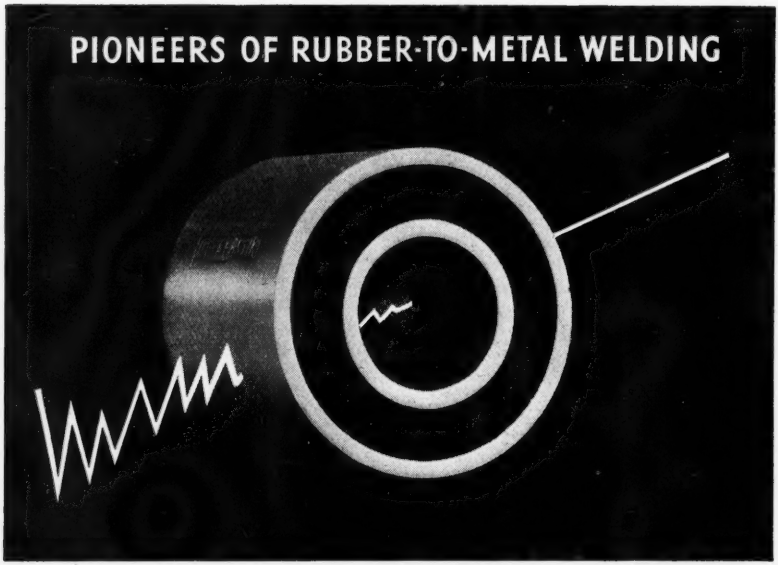

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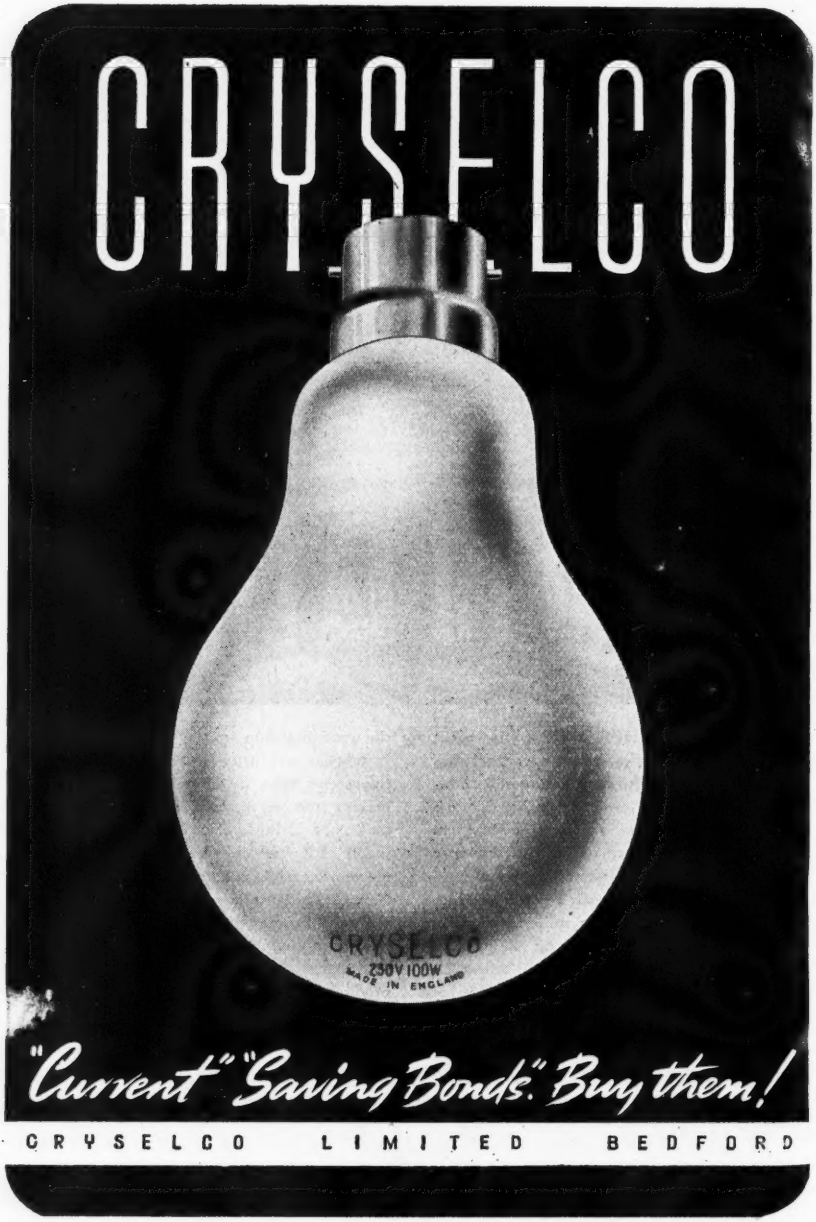
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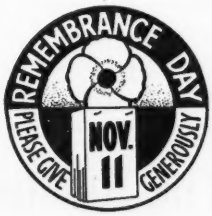

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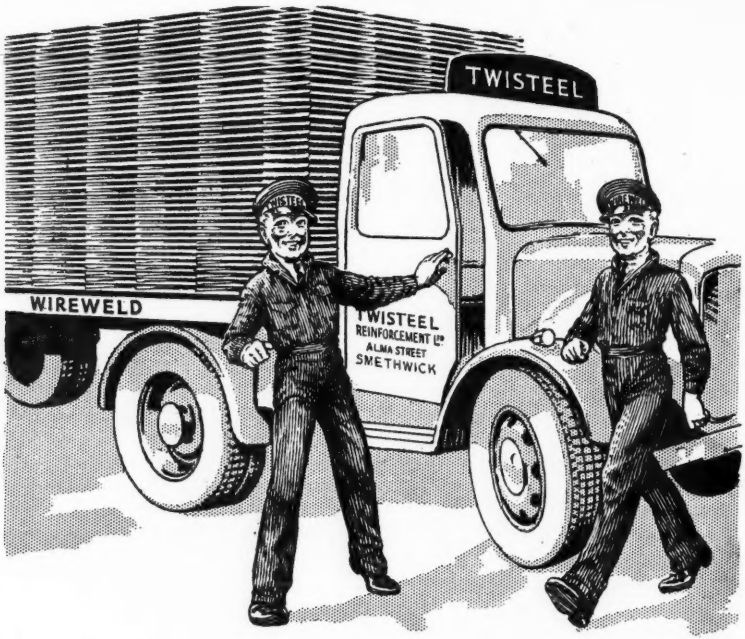

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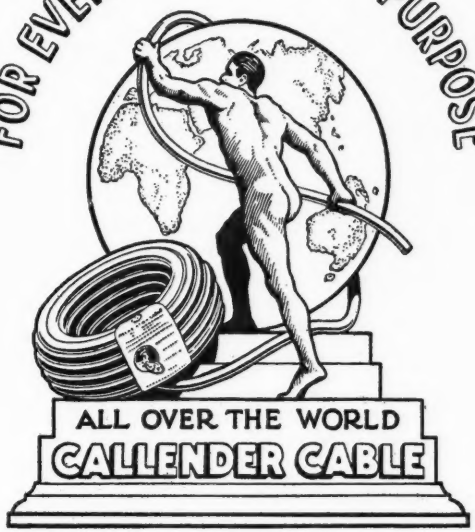

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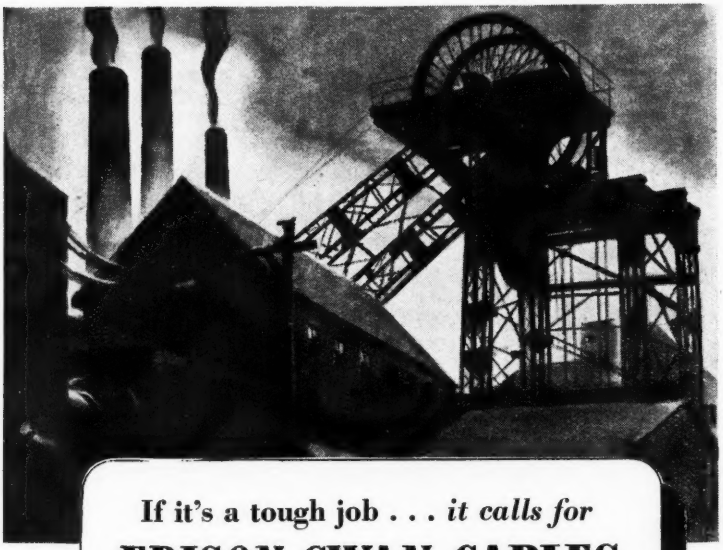

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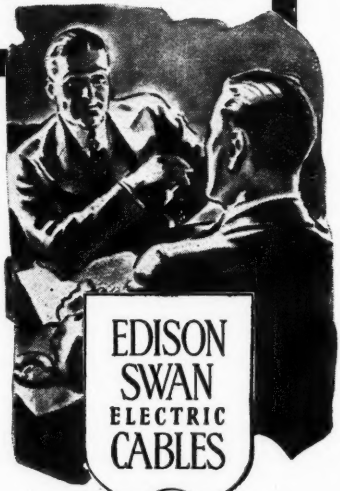

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ELECTRICAL REVIEW

Volume CXXXI — No. 3389

Friday, November 6, 1942

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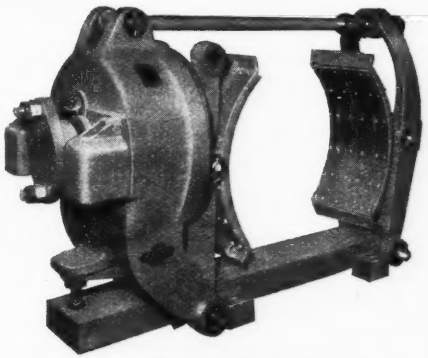

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Vol. CXXXI. No. 3389. NOVEMBER 6, 1942 6d. WEEKLY

Welding Technique

The Need for Clearer Conceptions

THE article on the welding work in an aircraft factory in this issue purposely stresses the metallurgical aspect because of confusion which exists regarding the technique of different welding processes in relation to work on different materials. The differences between the various processes of fusion welding, for instance, are not merely those of personal preference for one type or make of equipment over another.

In the more exacting kinds of production, in which electric welding shows increasingly promising results, there is a best process for each class of work and often, indeed, for each job, and it is only after exhaustive investigation has been made that the process to give the best results can be clearly decided upon.

Importance of Training

The idea that special training for welding operatives is unnecessary has been largely responsible for the lack of appreciation of differences in technique. Where stresses are of small account little more is required than the ability to deposit an approximate amount of metal at a given point, but this does not enhance the value of electric welding in production.

Welding must be regarded as a highly skilled process and the operative must not only realise the importance of correct methods of deposition, including precise electrical values, but he must have some appreciation of the characteristics of the base and deposition materials he handles.

The earlier controversy regarding fusion *versus* arc welding was not merely a question of interpretation of terms, for there are really two welding fields, although the line of demarcation is extremely vague, with much overlapping. Very broadly one can consider electric arc welding as part of a wider field of fusion welding which includes the non-electrical processes. But as electric fusion welding develops to embrace more advanced processes such as atomic hydrogen welding there is a growing tendency to separate the two fields within the limits of electrical processing. These are still early days, however, and we can confidently leave that question for the time being and get on with the job.

Supply Problems

The rapid progress of electric welding has resulted in electricity supply problems of which large block loads and low power factors with AC work are among the more serious and need the most careful consideration. But there is no need to fear that they will not be overcome.

In the field of industrial heating, electricity supply problems comparable technically with those related to welding, which have involved load increases many times the magnitude of those that are likely to be incurred in welding, have been met without much fuss.

Although the foregoing mainly concerns fusion welding, we must not overlook the importance of resistance welding, the characteristics of which demand entirely different technique. Resistance welding, with its more specialised equipment and

less specialised demands on the operatives, more readily fits into the modern "materials handling" conception of intensive production and is becoming more nearly a "machine tool."

Use and Beauty

IN his address to the Scottish Centre of the I.E.E. Mr. W. Sutcliffe refuted the idea that a design which is technically right for a specific duty ought to please the eye : in other words that "use is beauty—beauty use." He also claimed that a pleasing appearance was not necessarily inconsistent with reasonable cost. Switchgear was specially mentioned as a difficult subject æsthetically, but the designer need not despair. Some pieces of modern sculpture have reminded us very forcibly of ironclad units.

Main-Line Electrification

THE limits imposed by the basic characteristics of a railway, *viz.*, loading gauge, axle load, drawgear equipment and braking efficiency, are shown by Mr. G. R. Higgs, in an address to the Argentine Centre of the I.E.E., to be much higher in each case for electric than for steam traction. These are fundamental advantages and they lend support to the advocacy by Professor Fortescue in his presidential address of the carrying out of the Weir Committee's recommendation regarding main-line electrification as soon as circumstances permit.

Practical Planning

A VERY necessary warning against unrealistic schemes of post-war electricity supply was given by Major R. H. Rawll in his address as chairman of the I.E.E. South Midland Centre. There will be plenty to do in planning for the growth of load and clearing away anomalies, due mainly to rapid development, which have been a thorn in the flesh in the past.

Standard Cookers

THE gas and electricity supply industries have learned much from one another and so it is always of value to study what the "other side" is doing. In this issue we deal with a report by a committee set up by the Institution of Gas Engineers to consider the question of cooker standardisation—a question which has been raised in our industry. The committee found no general agreement in favour of a nationally standardised cooker although all witnesses were in favour of "rationalisation" which means, broadly, the reduction of the number of types and a measure of interchangeability of parts. The committee's recommendations are in line with the evidence. One, at least, will be sympathetically read by electrical men: that manufacturers should not alter their designs to suit individual purchasers' whims. Other lines mentioned in the report run parallel with those of the electric cooker manufacturing industry.

A High-Voltage Shock

WHILE it is recognised that the effects of electric shock vary widely with individuals, a case which came to the notice of the Electrical Branch of the Factory Department presents an example of what some people can stand. A steelwork erector during the construc- of a one-storey building came into contact with a bare overhead conductor of a 22-kV three-phase overhead line. Although contact was maintained for some considerable time and deep and extensive burns were suffered, the man recovered. The erection of a building immediately under and within 4 ft. of bare high-voltage conductors provides an illustration of the kind of risk that is being taken in industry nowadays.

A Step-up Tariff

FOR many years the Mountain Ash undertaking has had the distinction of supplying electricity at a remarkably low lighting flat rate, and it has been customary to give consumers a "Christmas box" in the December quarter in the shape of a special reduction in the rate. This year the undertaking, which serves a Glamorganshire coal-mining area, has adopted the usual practice but to prevent extravagant use of electricity it has instituted what is believed to be the first example of a step-up tariff in this country. For the first 100 kWh the charge is to be ½d. per kWh and thereafter 1d. The "gift" this year is bigger than usual and in announcing it the chairman of the Electricity Committee praised the work of the electrical engineer, Mr. E. W. Jones, in making the undertaking so successful. Another councillor hinted that they might celebrate the end of the war by making no charge at all.

Thorough Scientific Preparations to Ensure Correct Processes

BY the courtesy of Airspeed, Ltd., we recently had the opportunity of seeing in one of their assembly factories various applications of welding to the production of aircraft. That in itself was particularly informative, but we believe it will be of even greater value to our readers, in view of the present rapid advance of welding, to describe the exacting planning which is carried out under metallurgical supervision in order to be able to decide before work starts just what types of welding processes are needed for the various jobs and to see that the welding operation is carried out to design rather than that the design is created to fit the welding work.

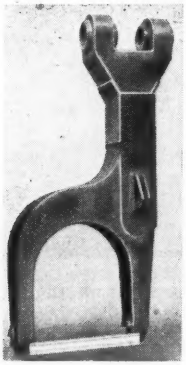
Fusion welding is applied mainly to mild steel and medium tensile steels of the 1·5 per cent. manganese type in the production of components varying widely in shape and for which minimum strengths are called for to permit the performance of specific functions. By present methods of fabrication, the components are produced in batches and have to conform to a very high standard of interchangeability, so that they must be dimensionally precise. Further, the present pace of aircraft production leaves no time to spare in the welding shops. The production of welded fittings to satisfy all the requirements, then, cannot be dependent on the use of any one method and it is essential to make the best possible use of the most suitable available process.

Four welding processes are now in use throughout the shops—oxy-acetylene, normal metallic arc, atomic hydrogen and spot welding—and in accordance with the requirements of production the work is parcelled out to these four methods, each of which has definite advantages over the others for specific classes of work. It has taken considerable time to obtain the fundamental data upon which it has been possible to assess these advantages, but results have now shown that the policy of not tying up all the work to one process because of individual preference is sound.

An exhaust heater muff is entirely arc welded and fabricated from 20g No. 18.8 stainless steel

In the case of a particular fitting or component for fabrication the draughtsman first creates his design and indicates on the assembly drawing the position of the welds. This drawing is then submitted to the stress office for a check-up on the ability of the component as a whole to perform the function for which it is designed, and an examination upon which is decided the type and thickness of material to be used and the size of the welds to be made. An indication is also given of the welding method

preferred, the type of welding rod (electrode) which should be employed, and whether or not the component will require to be heat-treated after welding.



Jury undercarriage made from mild-steel sheet by metallic arc welding

If a fitting is lightly stressed, small and made up of comparatively thin sections oxy-acetylene welding is employed to produce the best results in terms of strength and finish. If, however, a fitting is more severely stressed, has heavier sections and demands complete absence of distortion to avoid truing-up operations, then a choice is given between oxy-acetylene and metallic-arc welding. While this implies that the design office would be satisfied with either method so far as it is concerned, the choice is made in in the shops only after a close examination from the purely production angle.

Thick sheet fittings and those which are still more severely stressed are considered to be beyond the scope of oxy-acetylene welding. For these arc welding alone is acceptable and a rod known to possess minimum physical properties which will satisfy the strength requirements is indicated.

The axle is a mild-steel forging butt-welded to the ends of a vee-strut of two tubes

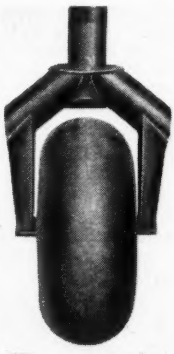
Another class of work applies to prototype aircraft and concerns particularly highly stressed fittings for which alloy-steel forgings are normally used. Uncertainty may exist regarding the final shape of the forging which is not required in large numbers at any one time. Further, it takes a long time to obtain special forgings under present conditions mainly because of the necessity to produce special forging dies which, in themselves, are costly, especially if they are used only a few times. To meet such special conditions fabrication is provided for in the design stage and the fittings are produced from easily-welded and heat-treatable steel.

Experience has shown that for this class of work the best results are obtainable by atomic-hydrogen welding, using a welding rod which may be a special steel of the same type as the base metal, but having a small excess of certain ingredients such that the deposited weld metal will have practically the same chemical composition as the base metal. Thus, after heat treatment, the purpose of which is to raise the mechanical strength of the base metal, the weld metal has practically the same strength and the fitting as a whole is homogeneous as a stress carrier.

To quote examples of this, material D.T.D. 124 A is a 1·5 per cent. manganese steel having a maximum carbon content of 0·25 per cent. It is obtained in the soft condition in which it can be readily blanked and bent. After hardening and tempering a proof stress of between 40 and 55 tons per sq. in. can be obtained, the latter figure varying with the actual tempering temperature. Metal D.T.D. 137 A is also a 1·5 per cent. manganese steel, but it has a maximum carbon content of 0·5 per cent. By the use of this material as a welding rod a weld metal having the same chemical composition as material D.T.D. 124 A is obtainable and the mechanical properties of resulting butt welds (*not* resistance welding) are equal to those of the metal D.T.D. 124 A after hardening and tempering.

Both these materials are readily available and for the welding rods strips sheared from the sheet metal are all that is necessary to obtain high-strength welds with this process. No special welding rods are required, as would be the case if normal arc welding were employed.

The work of the normal arc-welding department is concerned mainly with the welding of aircraft components, ground equipment and factory maintenance, in which last case the plant is either taken to the job or *vice versa*. The installation includes a number of SA 150 portable motor-generator sets. Each set is fitted with foot control whereby the welding current can be varied during operations without breaking the arc and by which also an undesirable crater

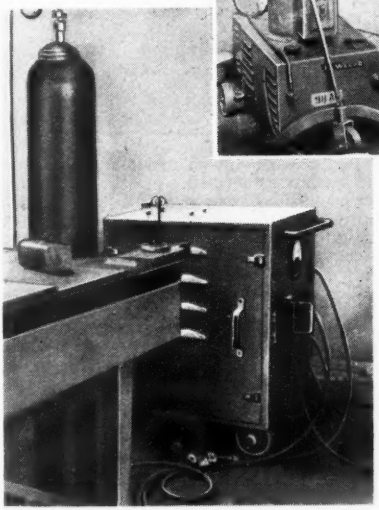


An entirely arc-welded wheel fork has side members of box girders of No. 18 gauge material

at the end of a welding run is eliminated.

A number of different types and makes of welding rods are in use for tackling the wide variety of work which is undertaken. Before being allowed to weld aircraft components the welders undergo intensive training and have to satisfy the company's standards before they can produce test pieces for A.I.D. approval.

The following selected examples of the products of the department will serve to indicate the nature of the welding processes. An exhaust heater muff is entirely arc welded and

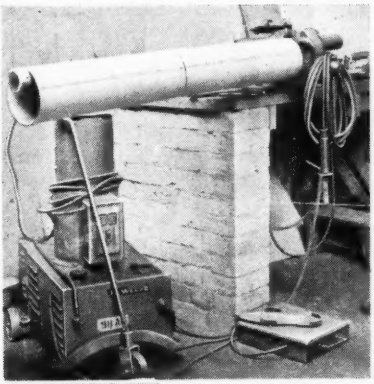


For the atomic-hydrogen process 75-A equipments are employed

fabricated from No. 20 gauge metal D.T.D. 171 (No. 18·8 stainless steel). A jury undercarriage is constructed from No. 10 gauge mild-steel sheet by metallic arc welding. In a part of an undercarriage the axle is a mild-steel forging which is butt welded (*not* resistance welding) to the ends of a vee-strut composed of two tubes. An entirely arc-welded wheel fork has side members constructed of box girders of No. 18 gauge material.

For the atomic-hydrogen welding 75-A equipments are employed. As a general rule a 35-A torch is used, although certain of the lighter aircraft components which are difficult to weld by oxy-acetylene are produced by the atomic-hydrogen equipments using a small 15-A torch. This is an example of those cases brought about by the policy of leaving the choice of the alternative welding processes to the foreman welder.

As an example of the use of the atomic hydrogen process for the fabrication of fittings to replace alloy-steel forgings we may cite a pair of wing root fittings on the S.P. Oxford. One is a forging and the other a welding. The fittings are interchangeable and they typify the use of fabricated fittings to help out the existing supply of forgings for use on prototype aircraft.



Each of the metallic arc welding equipments has foot control whereby the welding current can be varied without breaking the arc

Another valuable use of the atomic hydrogen process is found in the repair and fabrication of cutting tools. An example is a milling cutter having a mild-steel centre with high-speed steel inserts. After atomic-hydrogen welding it is annealed, formed and finally heat treated, thus saving a considerable amount of high-speed steel. A fractured blanking die is a good example of many tool reconditioning jobs which find their way to the atomic-hydrogen shop, as are also two jig boring cutters, the tips of which, having become worn, have been reinforced by the atomic process and re-heat-treated after grinding.

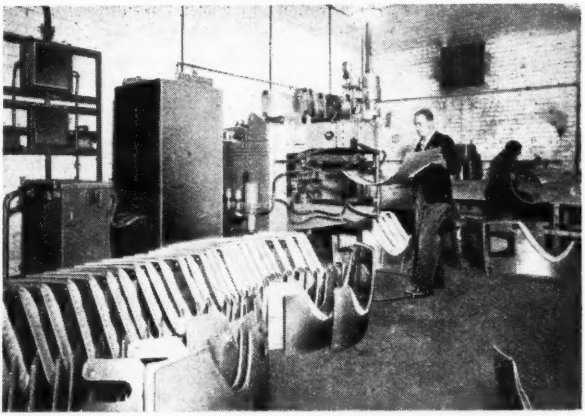
Spot (resistance) welding is employed on a wide variety of cowlings and panels constructed principally from aluminium and having duralumin stiffeners. Cowlings for prototype aircraft have been made from alclad and even magnesium alloy sheet with appropriate stiffeners added by spot welding. Cleaning the materials is of vital importance and for aluminium and alclad the best results have been obtained by using steel wool.

Two wing root fittings, one a welding and the other a forging, are interchangeable and typify the use of fabricated fittings to help out the supply of forgings

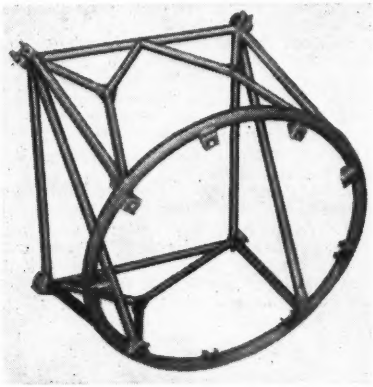
Duralumin is cleaned chemically by the use of a fluoride paste which is applied where

required and washed off a few minutes later.

It has been established that the speed of spot welding is five times greater than that of riveting, but the weakness of spot welds in tension has so far precluded their use on primary stressed components. To prevent tension failures of spot-welded stiffeners the company's general practice is to place a rivet at the end of each seam and at intervals of 6 to 12 inches along the seam, the pitch varying according to the character of the product. These rivets are not really additional because in any case it is customary to hold the components in the required position by means of spring clips inserted in small holes through the sheet and stiffened at intervals along the seam. After the spot welding the clips are removed and the holes are filled in with cut rivets.



We saw a DC spot-welding machine at work, the power supply being obtained from a mercury-arc rectifying valve



If the fitting is lightly stressed and made up of comparatively thin sections oxy-acetylene welding is employed, as in the case of this tubular engine mounting

We saw a spot-welding machine employed on such work. It is a DC equipment, the power supply being obtained from a mercury arc rectifying valve close by. The electrodes are operated by compressed air under contactor control for the air valves.

Test pieces are prepared before a job is started or when any change in the settings of the machine is effected. Further, test pieces are taken during a run at intervals of 1,500 "spots." The test pieces are sent to the laboratory where they are tested for tensile strength and the test results are reported. Only if these results are satisfactory is the welder allowed to proceed with the work. In practice, however, the results of these tests have in all cases exceeded the maximum designed figures.

We are indebted to Mr. R. Smallman Tew, metallurgist to the company, for his help in obtaining the above information.

Polarographic Analysis

STEADILY increasing uses of the polarograph (Heyrovsky pattern) for micro-analysis by electro-chemical means add interest to a 35-page illustrated brochure (List 109) of the Cambridge Instrument Co., Ltd., which is justifiably claimed to be unusual in its thorough treatment of the general principles (see *Electrical Review*, September 4th, 1942, p. 297) and methods of procedure.

A valuable bibliography comprising 168 selected references is included, as well as tables and a chart of half-wave potentials. Attention is specially directed to the large number of actual records reproduced from original polarograms obtained during investigations in the company's own research laboratories. This particular make of instrument is designed to be completely self-contained; the method has very great possibilities both as a tool for research and for conveniently quick routine analysis in a remarkably wide field of application, and it is also capable of detecting extremely small amounts of mineral salts in solution.

Insulating Wood

Experimental Development of Improved Qualities for Electrical Purposes

By A. E. L. Jervis

The insulating properties and tooling applications of laminated densified wood were described in the March 27th, 1942, issue of the "Electrical Review." In the present article the author summarises the results of subsequent experiments and tests

THE classification of superior plywood as a plastic laminated material may seem strange, although the bonding medium is a thermo-setting substance and, moreover, the shape of the product undergoes a change. (Compression while hot may reduce 0·02 in. veneers to 0·01 in. thickness with the fusion of intervening glue films 0·004 in. thick.)

Ignoring what can be done with protective varnishes against the weather, or exclusion of moisture, processed wood that is otherwise quite unprotected is a good insulator in air, or

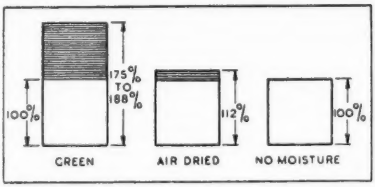


Fig. 1.—Moisture content of natural beech and birch woods

out of doors, and in hot oil. Several kinds of wood can be employed, but it is better to select one variety and try different resin bondings, on which the final electrical characteristics depend.

Attempts have been made to improve wood by impregnating and densifying it under pressure in the solid state, without resorting to laminating. That method presupposes freedom from hidden flaws, otherwise it would be difficult to claim homogeneity, whereas cutting the raw wood into thin slices makes imperfections in veneers readily distinguishable so that they may be discarded during manufacture. Optimum thickness is not easily determined, but it is correct to say that the thinner the laminations are the greater will be the mechanical strength of the finished assembly. It is easier to dry out and then impregnate thin veneers, although they need to be handled much more carefully. The thinner the veneers are the more expensive will be the final product.

It must be clearly understood that the processing of "electrical" wood is in many respects based on work carried out in the production of densified "mechanical" wood,

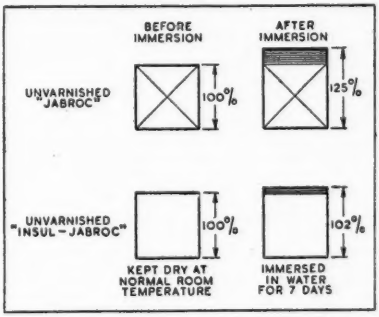


Fig. 2.—Water absorbed by immersing laminated densified wood for seven days

which has been successfully utilised for many years under the trade name of "Jabroc" for the manufacture of aeroplane propellers and

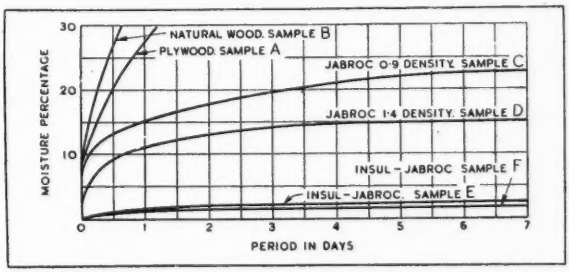


Fig. 3.—Comparative moisture assimilation of different samples

aircraft tools. Pioneer work in this country was done by Mr. B. Jablonsky (of Moulded Components (Jablo), Ltd.), one of the earliest

air pilots, whose flying licence is numbered 30 and dated September 28th, 1910.

Good quality "electrical" wood has been built up both at home and abroad from

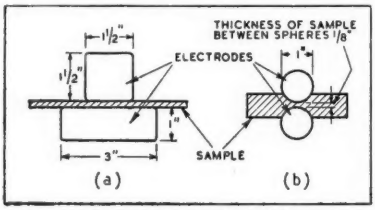


Fig. 4.—Rectangular and spherical electrodes for voltage stressing tests

veneers ranging from 0·03 in. to 0·06 in. in thickness, whereas present investigations in this country are concerned with the electrical behaviour of somewhat thinner material, because beech and birch veneers as thin as 0·02 in. are readily available.

Laboratory and Works Tests

Since my previous article on this subject research has been conducted at Queen Mary College, University of London; many experiments have been performed, while samples of different types of material have been subjected to tests in some of the principal electrical factories in northern England, which it is hoped may assist in the production before long of a generally acceptable specification for laminated insulating wood that has been densified.

The information available about this new insulating material has been so scanty that one of the first questions which arise has usually been concerned with the amount of moisture likely to be absorbed by it. How small such assimilation is may be appreciated by contrasting it with the water content of ordinary beech (fig. 1) from which the laminations are cut. How quickly natural wood will reabsorb moisture is indicated in fig. 3, which also records the water absorption during tests of four types of improved wood, the superiority of which may be gauged by comparing figs. 1 and 2.

Resin impregnation is effected after the veneers have been properly dried, there being a wide choice of urea and cresol formaldehydes in liquid form and of phenolic formaldehydes in sheet form. Material built up of alternative layers of laminations of wood and sheets of resin seems (to date) to be better for mechanical than for electrical applications.

The reason for the inferior electrical characteristics of an assembly of this particular form is probably the fact that the fused glue films do not penetrate sufficiently far into the veneers with the result that impregnation may not be perfect. It is quite possible that satisfactory electrical properties could be obtained by the employment of extremely thin veneers made up in combination with glue films.

However, for the purpose of the present experiments liquid resins were utilised, but instead of making use of a vacuum impregnating tank they were applied by means of a spreading machine and the veneers were then

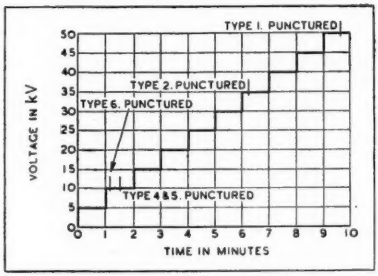


Fig. 5.—Puncture voltage tests carried out on "Insul-Jabroc" boards

allowed to dry until their surfaces were no longer sticky. The three kinds of impregnants tried were cresol formaldehydes No. 1 and No. 2 (the second applied to three sets of veneers in varying proportions) as well as water soluble phenol.

Five types of wood were made up and each subjected to pressure (proof stress) tests for determining electric strength, at 5 kV main-

TABLE I.—LAMINATED DENSIFIED WOOD TESTS

Type	Sample	No. of veneers	Resultant thickness approx.	Type of resin	Punctured at	Duration
(a)	1	21	¼ in.	Cresol formaldehyde No. 1	90 kV	After 9 min.
(c)	2	21	¼ in.	Water soluble phenol	35 kV	After 6 min.
(b)	4	19*	3/16 in.	Cresol formaldehyde No. 2	10 kV	After 1 min.
(b)	5	21	¼ in.	do.	10 kV	After 1 min.
(b)	6	21	¼ in.	do.	10 kV	After 1 min.

* Interleaved with sheets of fabric.

tained for one minute; then raised very quickly to 10 kV and maintained for one minute more. In other words, the test voltage was increased by increments of 5 kV

per minute until puncture of the specimen occurred. Electrodes of two shapes, as illustrated in fig. 4, were employed for the purpose of applying the stressing voltage to the samples.

The results obtained on boards of "Insul-Jabroc" ($\frac{1}{4}$ in. thick in four cases, $\frac{5}{16}$ in. thick in one case) using cylindrical applicators are summarised in Table I and shown graphically in fig. 5, whereas the other data set out at the top of Table II were determined by means of electrodes of spherical shape.

Table II.—TYPE A "INSUL-JABROC" TESTS

Test	Result	Method of Test
Breakdown of dielectric at 15 deg. C.	50 kV	In oil on recessed test piece between 1 in. diam. spheres $\frac{1}{8}$ in. apart.
60 deg. C.	15 kV	
90 deg. C.	10 kV	
Surface flash-over in air	75 kV	Test piece 8 in. by 1½ in. Electrodes 1 in. diam. discs with spacing of 6 in. between adjacent edges.
Surface flash-over in oil	80 kV (tracked across surface)	Test piece 5 in. by 1½ in. Electrodes 1 in. diam. discs with spacing of 3 in. between adjacent edges. In oil at 20 deg. C.
Breakdown along layers in oil at 15 deg. C.	No breakdown at 100 kV flashed over surface	Electrodes ¼ in. diam. pins with 2¼ in. centres passed through holes drilled in test piece 4 in. by 2 in. by ½ in. thick.
60 deg. C.	60 kV	
90 deg. C.	48 kV	
Tensile strength	5 tons per sq. in.	As specified in B.S.S. 316–1929. Appendix VIII.
Compression	0·03 in. with ult. load of 10,000 lb.	As specified in B.S.S. 316–1929. Appendix IX.
Impact strength (a)	0·9	Izod machine and two-notch test piece as in B.S.S. 131–1920.
(b)	0·4	
Plastic yield	2 mm.	At 175 deg. C. with test piece 3·35 in. long by 0·236 in. square, clamped at one end, and load of 75 grammes applied by stirrup to free end. Test piece maintained at test temperature for 6 hr. before applying the load.
Cross breaking strength at 15 deg. C.	lb. per sq. in. 18,000	As for plastic yield, but with load applied gradually at rate of 20 lb. per min.
60 deg. C.	17,500	
150 deg. C.	17,250	
Oil absorption at 15 deg. C.	0·09 per cent.	Test piece 1½ in. by 1½ in. by ½ in. thick immersed in oil at test temperature for 24 hr.
Density	1.29	Test piece 1½ in. by 1½ in. by ½ in. thick.
Effect of hot oil	Nil	At 115 deg. C. for 24 hours on test piece 3 in. by 1 in. by ½ in.
Effect of acids and alkalis		Test piece 3 in. by 1 in. by ½ in. thick immersed in 5 per cent. solution of acid or alkali for 24 hr. at 15 deg. C.
(a) nitric acid	No visible effects	
(b) hydrochloric acid		
(c) sulphuric acid		
(d) caustic soda	Darkened & warped Surface softened	

Note :—All tests carried out in oil complied with B.S.S. 148–1933 for Class B oil.

Canadian Notes

Transformer Rationalisation

A RECENT Order prohibits the manufacture in Canada of transformers other than those of stated ratings and characteristics. Schedule "A" covers distribution transformers up to 200 kVA, 15,000 V, but excludes auto-transformers, testing transformers, regulating transformers and other special kinds. Schedule "B" relates to power transformers. It is laid down that transformers may not, except with the permission of the Administrator, be manufactured except in the rated capacities for each voltage set out in the Schedules, and of specified characteristics.

The Order places restrictions on the manufacture, installation and supply of accessories, and prohibits the sale of any transformer, except to or for Government Departments, other than by special authorisation from the Administrator.

Control in Quebec

Important changes may be expected in the economic organisation of the Province of Quebec as a result of the war, including the creation of a Hydro Commission. This was stated by Mr. T. D. Bouchard, Minister of Roads and Public Works, at a luncheon of the Granby (Quebec) Chamber of Commerce. Mr. Bouchard said he did not wish to criticise private companies, but he believed the time had come for the Province to have its own Hydro Commission, which would sell electricity at cheaper rates to industries and domestic consumers.

Load Restriction in Ontario

The Munitions and Supply Department has made an Order reducing the load upon the Ontario Hydro-electric Power Commission of two companies at Thorold, Ontario, from 40,000 to 15,535 HP. The announcement states that the Order is one of several measures to assure sufficient power for the war plants of southern Ontario. The companies concerned are the Ontario Paper and the Beaver Wood Fibre Co.

Electricity's Future

Tariffs and Appliance Standardisation

SOME of the factors that are affecting the supply of electricity, which require immediate attention, are discussed in the inaugural address at Birmingham of Major R. H. Rawll (Corporation Electricity Department) as chairman for the second year in succession of the South Midland Centre of the INSTITUTION OF ELECTRICAL ENGINEERS.

Without meaning to belittle the value of post-war planning he contends that it should at least be realistic and capable of actual achievement, to avoid disillusionment and discontent after the war. Problems that require first attention do not need to be defined by special committees set up for the purpose; they are well recognised, though their resolute solution is continually postponed. The war is forcing them into true perspective and, if they are honestly faced now so that appropriate action can be taken as soon as possible after the war, a firm basis will be provided for post-war progress.

Chaotic Tariffs

In referring to the present chaotic tariff position, Major Rawll does not mean the differences in prices charged by various suppliers for the same class of load, but the aggravation caused by making tariffs suit the load. Variety of methods of charging may have been a necessary encouragement in the competitive past, but its continued retention is a decided brake on commercial development.

The aim should be to offer an all-in tariff for all purposes to permit the use of electricity at all times without restriction, rather than encourage loads by the doubtful expediency of inducement by low rates under conditions which impose decided inconveniences on consumers. If the industry is to keep pace with the demands which will be made upon its services in future, each supplier must have one tariff only for all energy delivered at low voltage, whether domestic, commercial or industrial, though the actual rates charged and the actual form of payment will vary.

Perhaps the greatest obstacle to such simplification is the very considerable revenue derived from lighting; its reduction by the institution of a single tariff will presumably necessitate increasing the rates charged at present for other classes of load. This nettle must be grasped sooner or later.

The standardisation in certain particulars of the essential components of electric cookers is of paramount importance. For instance the dimensions and methods of connecting hotplates of whatever type and make should make them interchangeable in any cooker. Similar maintenance convenience is desirable in respect of other appliances.

It will be essential to remodel hire and hire-purchase schemes so as to put them on a firmer financial basis than in the past, in view of the economic conditions that will prevail after the war and the undoubted demand which will then be experienced for domestic appliances. Hire-purchase, or credit sale, is preferable to simple hire because it avoids cancellation of agreements for frivolous reasons and enables consumers to acquire apparatus embodying the latest developments.

While extremes must be avoided, Mr. Rawll feels that the industry is still erring on the ultra careful side; it can afford to take a little more risk in its financial relationships with domestic consumers, since loss of industrial load upon diminution of the war effort will need to be counteracted determinedly by increasing the domestic load. The necessity for maintaining and even further developing good relations with the public in general and householders in particular, is, therefore, very apparent. But there has been too little discrimination between those household loads that should be encouraged and those which need not. It is Mr. Rawll's personal opinion that water heating deserves fullest support, for it has not the seasonal and peak disadvantages associated with heating and furthermore, improvement of equipment and more extensive use of thermostatic control are capable of materially improving its individual load factor.

Reconstruction

It seems evident that electricity is expected to play a not unimportant part in post-war reconstruction. The industry should, therefore, be prepared to lead by itself informing the public in general what its intentions are, instead of merely contenting itself with making suggestions and recommendations to "outside" official committees whose terms of reference are often so wide that the electrical viewpoint is lost.

That desirability pushes into prominence the need for one body that can authoritatively act as the mouthpiece of the whole electricity supply industry. While some progress has admittedly been made in this respect, the machinery is still far too cumbersome and the procedure too protracted to be really effective. By keeping the general public well informed of the particular problems of the electricity supply industry and encouraging interest in its activities the greatest measure of goodwill will be created for any increased State control of the industry that may be proposed in future.

Coal for Steam Raising

Importance of Consistency of Quality

HOW power producers have been affected by the Coal Mines Act, 1930, which has become monopolistic in so far as the production and disposal of fuel are concerned, thus removing the normal commercial safeguards of free competition, is plainly shown by Mr. J. N. Waite (Central Eleetricity Board) in the paper he presented to a joint meeting in London yesterday of the Institutions of Electrical and Mechanical Engineers, to which members of the Institute of Fuel had also been invited.

The paper reviews power producers' requirements respecting quality of coal and advances proposals concerning conditions of sale and the removal of foreign matter from coal before it is marketed, commenting also upon the useful purpose reserve stocks can be made to serve. Graphs indicate the continual increase of the average price of coal delivered to power stations operating on the national interlinking grid system, amounting in 1939 (when the rate of rise showed some signs of easing off) to over 36 per cent. above the 1932 price. The price to power stations has increased by a greater amount than to other users. Notwithstanding a 21 per cent. decrease in the amount of coal consumed and a 3 per cent. improvement in its calorific value, the average net cost of heat per kWh sent out was 9 per cent. higher in 1939 than in 1932. The gain due to technical progress has been outbalanced by the rise in the cost of coal.

Standard Conditions of Sale

Such statistics emphasise the vital interest of power producers in all future legislation for the government of the coal industry, which seems likely to remain upon a national basis. Therefore it is appropriate to suggest that there should be national standards by which quality can be compared and that conditions of sale should be so standardised as to ensure that the reasonable requirements of coal users are complied with. Mr. Waite accordingly attempts to marshal the main essentials from the point of view of users, who have a right to be assured that they wil! not be called upon to bear an undue share of the cost of producing and distributing coal.

It cannot be too strongly emphasised that consistency of quality is an essential requirement, and the sizing of fuel is an important aspect of its quality. Coals must be matched with the design of combustion appliances, for furnace arrangements are physically incapable of maintaining intended rates of combustion with unsuitable fuels. Blending must be judicious, to form a homogeneous mixture of similar kinds of coals, while fuels with a volatile content of less than 11 per cent. need to be fired in a pulverised state. Combustion rates with highly volatile coals range up to about 50 lb. per sq. ft. per hour, whereas with less volatile varieties the maximum rate is not more than 30 lb. This fact coupled with the fundamental difference between the processes of combustion in the two cases (breaking up into hydro-carbons and spongy cake in the former case while burning directly in the latter) renders it essential for boilers to be supplied with fuel of a volatile content approximating to that for which they are designed, since any serious departure therefrom will depreciate their performance.

Mr. J. N. Waite is manager for S.E. England, Central Electricity Board

Since power producers spend capital on plant designed to utilise coal of definite qualities, it seems reasonable to expect the price paid per ton to be directly related to its average calorific value as delivered. Wide variations of that value are due mainly to different ash and moisture contents, British coals of a calorific value below 8,000 BThU per lb. being quite useless for commercial purposes. Differences between inherent and actual ash contents are due to impurities resulting from mining and preparation methods, which aspect raises issues of national importance. What is wanted is that the ash content of coal delivered shall at all times be within the defined limits for which the ash-handling, grit-handling and soot-blowing equipments have been designed.

Reasonable Consistency

Again, reasonable consistency is needed to minimise capital expenditure on plant, consistent with satisfactory performance over a reasonable range of variation. Fair constancy of moisture content is also desired for it is both a diluent and an absorber of heat. An increase of 5 per cent. in moisture will lower boiler efficiency by 0·6 per cent. with an exit gas temperature of 300 deg. F. Standardisation of the nomenclature of classes of coal and of grading for size, relating one to the other, is seriously overdue.

To make the best use of national resources certain quality requirements are essential, otherwise waste of both capital expenditure

and coal consumed is bound to occur. Requirements, negotiated between power producers and the coal industry, should be expressed in a document similar to the existing standard "I.E.E. Conditions of Contract" which, together with appropriate B.S. specifications, could be used by all buyers for power production. Standards of quality and quantity should refer to fuel as delivered, not as loaded at collieries, and weighbridges should be periodically calibrated officially like other weights and measures. Right of rejection should be given when the volatile content falls below recognised limits, while price should rise and fall with calorific value, directly when the permissible variation is small and graded when it is large.

Cleaning of Coal

Tabulated statistics indicating the variation of ash content and its effect on calorific value support the author's contention that superfluous adulterations should be removed at the collieries, aiming at the reduction of ash after combustion to one quarter of the present amount. The need for cleaning coal is recognised ; in 1938 the amount treated was 103·2 million tons, equal to 45·4 per cent. of the saleable output. Of that total 82·3 per cent. was dealt with at washeries, 15·5 per cent. at dry-cleaning plants and 2·2 per cent. by flotation, though most of the present treatment may legitimately be termed partial cleaning.

It is practicable to remove virtually all foreign matter, say 8 per cent., leaving only from 1 to 3 per cent. ash inherent in the coal. Whether it is economic to do so depends upon the cost of cleaning compared with the savings resulting therefrom, which are summarised as annual gains due to reduction of sensible heat lost in ash, £114,000 ; increase of boiler efficiency due to less unburned carbon enclosed in ash, £960,000 ; reduction of cost of removing residues, £1,000,000 ; saving in cost of transport, £1,600,000.

The total cost of complete cleaning may be expected to be of the order of 9d. per ton. Thus if 60 million tons priced at £1 per ton (1939) are treated there will be the substantial net gain of £1,424,000 per annum even if the present cost of partial cleaning (6d. per ton) and the rising price of coal are ignored.

Pulverised Fuel

Less coal will be lost in complete than in partial cleaning, while the prior removal of dust for sale as a separate product, of a heat value approximating to that of uncleaned coal, will make about 10 million tons available for pulverised fuel firing. Collaboration should enable all of it to be utilsed, since in 1938 over 6 million tons of powdered fuel was burned. Fine coal dust is a dangerous substance. The logical places for its utilisation are as close as possible to sources of production. If necessary long term agreements can enable power stations to be built on appropriate sites to absorb it.

Statistics show the material influence exerted by seasonal changes in demand on the price of coal, which could be lowered if collieries could produce at a constant rate throughout the year. With proper mechanical handling large scale users can put to and reclaim from stock at a relatively small cost per ton, thus contributing towards evening out other seasonal demands.

It should be possible to continue some of the wartime arrangements made with this object, the cost incurred being taken into account in the selling price. For equity any reduction in cost of production should be credited to users enabling such reduction to be effected, while users making seasonal demands should be charged accordingly.

Since coal is probably the most important physical asset of the British Isles, collaboration should be a part of post-war planning on a national scale ; it appears to be necessary for users to be represented on any authority that controls the production and disposal of coal.

Steel Manufacture

A SECOND edition of "Steel Manufacture Simply Explained" has been published by Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, Kingsway, W.C.2 (Pp. 185, figs. 43; price 7s. 6d.). The authors of this book, Messrs. E. Gregory, Ph.D., and E. N. Simons, are respectively the chief metallurgist to the Park Gate Iron & Steel Co., Ltd., and the publicity manager of Edgar Allen & Co., Ltd., an unusual combination of qualifications which ensures not only the technical reliability of the information but also provides a form of presentation which will be found attractive and intelligible to the non-technical reader. In the preface to this edition the authors' belief is stated that ". . . the most complex metallurgical operations can be described with simplicity and if so described, will be studied with interest and comprehension by a far wider public than would at first sight seem possible."

Some idea of the comprehensive nature of the book will be obtained from the following extracts from the table of contents : From mine to blast furnace, British blast-furnace practice, the manufacture of steel by the Huntsman crucible process, the high frequency or "coreless" electric induction crucible process, from ingot to finished bar, the Bessemer process, the Tropenas acid process, the open-hearth process, the electric arc furnace, refractories in the steel foundry and the steel works laboratory.

The book is illustrated with many dimensioned drawings of different types of furnaces as well as by a large number of photographs of the processes in actual operation which well convey the steelworks atmosphere and a good index gives easy access to any item. Although the work will be most useful to students and to those associated with the iron and steel industry, many parts of it will be read with interest by others.

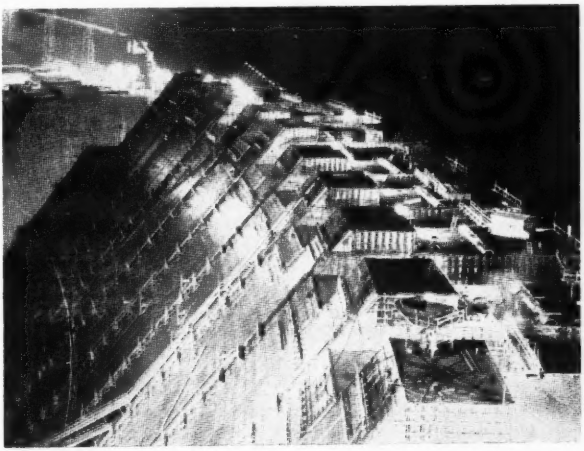
News from America

Priority for Water-Power Plant

ACCORDING to the *Electrical World* (New York), the United States War Production Board has granted high priority ratings to a substantial proportion of the Bureau of Reclamation programme of hydro-electric projects. The new priority ratings, it is said, will provide 1,055,600 kW of new capacity by 1944 and the Bureau is prepared to add another 700,000 kW to projects in operation or under construction.

Among the schemes to which approval is given is the Shasta Dam and three 75,000-kW sets. We reproduce a picture from our contemporary showing the dam in course of construction.

At the same time the War Production Board has cancelled, suspended or refused priorities for about 4,100,000 kW of hydro - electric and steam plant which private companies and public agencies had on order for installation in 1945.



Work proceeds at night on the construction of the Shasta Dam which will be the second largest in the world

The Board states that projects approved for installation during the latter half of this year, in 1943 and early in 1944 total 5,500,000 kW which is considered to be sufficient to ensure an adequate supply for war production, direct and indirect, with a small margin for unforeseen expansion in the munitions programme.

Cable Companies Charged

Nine companies supplying special fire- and water-resistant cable were indicted recently by a Federal grand jury on a charge of "conspiring to make identical bids at unreasonably high prices." The Attorney-General, Mr. Francis Biddle, stated that the companies had sold $55 million worth of cable to the Government since 1939 and had made profits ranging from 35 to 70 per cent.

The defendants were the Rockbestos Products Corporation and eight companies holding licences from that Corporation. The Corporation was said to have given the Navy Department an unrestricted licence to use its special cable in 1933 and arrived at an understanding with the eight other companies that their mutual agreement to sell at a uniform price to the public would not apply to the Government's calls for competitive bids. From then onward, however, the eight companies continued to receive copies of each bid prepared by the Rockbestos Corporation and to copy them identically and submit them as their own bids.

The Corporation, in reply, stated that it offered to re-negotiate all of its contracts with the Navy from 1940 to 1942 so as to reduce any price which was considered excessive, but the Navy had never indicated any dissatisfaction with the prices bid by the company and its licensees. It also said that although its production had been increasing its net profits, after meeting taxes, had been on a declining scale.

The General Cable Corporation, another of the defendants, said that the Government was purchasing the cable at the prices charged to other consumers and these prices were lower than before the war. The Government had not investigated costs and profit margins before taking this action.

The American General Electric Co. said that its policy was to take risks rather than make unreasonable profits from the defence programme. In the last few months it had

saved the Navy and Army very substantial amounts through voluntary price reductions in all kinds of equipment.

"Rationalisation" of Lamps

More than half of the various types of electric lamps now manufactured are to be eliminated by an order of the War Production Board, operating from November 1st. Although the order will not result in curtailment of the total lamp production, the Board said it would reduce the number of types made from 3,500 to 1,700. Lamps for which there is no present essential demand and types for which suitable substitutes are available will be discontinued. Thus, the common household lamp formerly made for voltages of 110, 115, 120, 125 and 130 is now to be made only in the 115, 120 and 125-V types. Likewise, 50-W and 75-W lamps will no longer be made on the ground that lamps in wattages of 15, 25, 40, 60 and 100 are adequate to meet all demands. The use of colours in lamps is also restricted by the order, which permits manufacture of only red, blue and green lamps.

Linking-up Schemes

An organisation of the Electric Bond & Share Co. system has drawn up a scheme for the interconnection of power plants throughout the United States whereby it is claimed that 3,000,000 kW of capacity would be added to existing facilities.

The report says that "it is entirely feasible to interconnect the great majority of such plants quickly, with present power systems constituting the source of the present public power supply. . . . The second step, once all available power is interconnected, is to use all such capacity for more hours per day, more hours per week, more hours per year." A survey of twenty-three utilities in twenty-four States forms the basis of the scheme, it being claimed that these form a reasonably good national sample.

Eleven power companies in the Mid-West and South-West States have linked their systems to form a "power pool" of 3,000,000 kW.

Wooden Factories

In order to save steel the Westinghouse Electric & Manufacturing Co. plans to construct five new war production plants of wood. Apart from the main construction, wood is to be employed for all window frames, gutters, etc. About 3,600,000 ft. of Douglas fir is being employed and 6,000 tons of steel will be saved.

Power for Synthetic Rubber

Three large steam turbo-generators are being built by the Westinghouse Company for synthetic rubber plants. A 35,000-kW set will be installed in a Western Pennsylvania plant producing butadiene and styrene from coal products. The others, 40,000 kW each, are for a works in Indiana which is to use petroleum as the source of raw materials.

It is stated that the abundance of high-pressure steam required for the production of butadiene and styrene will enable the plants to generate their own electric power as a by-product.

Engineering Cadetships

Technical Officers for the Forces

THE Government has announced the foundation of engineering cadetships leading to technical commissions in the fighting services. These will be open to youths aged 16 to 19 inclusive who have left school with at least the School Certificate, including a credit in mathematics, physics or science, and are not employed in any branch of engineering. Successful applicants will be given courses in engineering at technical colleges before being allocated to the Forces for training as technical officers. Applications will be received by local Appointments Offices of the Ministry of Labour and National Service or by the Appointments Department, Sardinia Street, W.C.2.

Engineers of professional grades are needed to ensure the maximum production of armaments but they are needed also to ensure that the maintenance requirements in the Forces shall keep pace with the supply of equipment. Measures for securing the supply of such men for all war purposes are worked out by the Technical Personnel Committee, which is under the chairmanship of Lord Hankey, with representatives of the Ministry of Labour and of the Service, Supply and Education Departments.

The State Bursary Scheme at universities and the intensive training scheme for the Higher National Certificate at technical colleges are producing a very substantial number of trained engineers. In addition a considerable number of young engineers are being withdrawn from civilian work to be commissioned as technical officers.

The Committee has, however, now arrived at the conclusion that all these schemes, even when they attain their maximum output, will not be enough and that a fresh source of supply must be found. The scheme of engineering cadetships has therefore been planned; its success will reduce the future demands of the Services upon the personnel of productive industry. Generous subsistence allowances will be paid to successful applicants. Full particulars are given in a leaflet issued by the Ministry of Labour.

It is stated that courses will be available at 87 technical colleges, accommodating 4,000 entrants or more. The courses will cover the basic engineering science required in the associate membership examinations of the Institutions of Electrical and Mechanical Engineers.

PERSONAL and SOCIAL

News of Men and Women of the Industry

A LETTER dated August 24th has been received from **Mr. A. E. Howkins,** of the Shanghai Power Co. in which he says that he and his wife are well and " all things considered " they are not faring too badly. They have their own house and garden in the Settlement and Mr. Howkins attends the office each day as the power company is operating as usual—but under Japanese control. He has even been allowed to keep his short-wave radio set. All private cars and motor buses have disappeared from the streets but the trams are still running.

Before going to Shanghai fourteen or fifteen years ago Mr. Howkins was with the Metropolitan-Vickers Co. and later at the Lister Drive power station, Liverpool.

Mr. A. C. Johnson, borough electrical engineer of Southend-on-Sea, who would normally retire in March next year, has intimated his willingness to continue in office for a further year. The Electricity Committee has recommended the acceptance of his offer.

Reuter reports from Moscow that the Faraday Medal awarded to **Professor P. Kapitza** by the Institution of Electrical Engineers " for his notable contributions to science in the generation and utilisation of intense magnetic fields " (see *Electrical Review*, February 27th, 1942) was officially presented to him on October 27th. In accepting the medal Professor Kapitza said that he greatly appreciated the honour conferred upon him by the award which he regarded as a symbol of the joint efforts of the two freedom-loving and democratic countries, fighting for freedom, real culture and science. Professor Kapitza, who was born at Kronstadt in 1894, is director of the Institute for Physical Problems at the Academy of Science, Moscow. He was a Clerk Maxwell Student at Cambridge University from 1923 to 1926 and served as assistant director of magnetic research at the Cavendish Laboratory, Cambridge. In recognition of the importance of his investigations he was appointed Messel Professor of the Royal Society, and in 1933, on the opening of the Royal Society Mond Laboratory, Cambridge, he was appointed director, later returning to Russia.

Prof. P. Kapitza

Sir Felix Pole recently presented gold watches to Messrs. J. Davidson and E. Paul for fifty years' service with the Edison Swan Electric Co., Ltd.

The St. Pancras Finance and General Purposes Committee has recommended that **Mr. W. G. Sutton,** shift charge engineer at the Corporation's power station, shall retire on superannuation on November 30th, " subject to such consent as may be necessary under the Essential Work (General Provisions) (No. 2) Order, 1942."

Sir Percy Ashley, K.B.E., C.B., has accepted an invitation to remain as chairman of the General Council of the British Standards Institution. **Dr. E. F. Armstrong,** F.R.S., formerly chairman of the Chemical Divisional Council, has been co-opted as a permanent member of the General Council.

Referring to a paragraph in our issue of October 23rd regarding the retiring allowance of **Mr. A. E. McKenzie,** the borough electrical engineer, the Wimbledon Corporation says that while it is true that the Council decided to defer further consideration of the matter until January, the last sentence of the paragraph was not correct.

Councillor B. A. Corry, a member of the Electrical Contractors' Association, is to be the next mayor of Southampton. **Mr. F. W. Cook,** another Southampton member of the Association was recently congratulated at a meeting of the local branch upon reaching his eighty-third birthday.

The *Electrical Contractor* reports the admission of another lady member to the Electrical Contractors' Association. She is **Miss Joyce Hornsby,** of A. E. Hornsby & Co., Gillingham, Kent.

Mr. Robert Nelson, foreman electrician at the Pumpherston Oil Works, Midlothian, was recently presented by members of the staff and employees at the electrical shop with gifts on his retirement. During his long term as foreman great extensions have taken place in the electrical plant at the works. Mr. Nelson was trained at the works of Bruce Peebles & Co., and was for some years with the Wemyss Coal Co., Fife.

Mr. A. E. Upton, of Macrome, Ltd., has been appointed works manager at the company's No. 2 factory which will be in operation shortly.

Mr. C. W. R. Pantlin, chairman of the General Cable Manufacturing Co., Ltd., has agreed to undertake the duties of managing director in succession to the late Mr. John Wright. The directors have appointed **Mr. John Whipps** as general manager of the company.

Mr. C. K. F. Hague has been appointed deputy managing director of Babcock & Wilcox, Ltd. He will continue to act in the capacity of director in charge of sales.

Mr. James Johnstone has retired from the Stirling Boiler Co., Ltd., after forty years' service with the company, for the past twenty-three years as superintendent engineer in charge of erection. He is succeeded by **Mr. D. L. Jarman.**

Mr. M. Farrer, senior area engineer and Twickenham district officer to the London and Home Counties J.E.A., is retiring on superannuation on December 6th. The Local Distribution Committee of the Authority has recommended that he shall be temporarily succeeded by **Mr. G. W. F. Horner,** area engineer at head office, at a salary of £1,200 per annum while he is so employed.

Mr. J. B. Longmuir, for over twenty years welfare and apprentice supervisor to Mavor & Coulson, Ltd., has taken up an appointment as

controller of welfare with Newton, Chambers & Co., Ltd., Sheffield.

Mr. P. G. Pettifor, A.M.I.E.E., has retired from the Woolwich works of Siemens Bros. & Co., Ltd., where, for over thirty years, he held the position of assistant manager of the apparatus shops.

Obituary

Dr. J. N. Collie.—The death is reported of Dr. John Norman Collie, F.R.S., Emeritus Professor of Organic Chemistry, University College, London. He was eighty-three years of age and held the chair of Organic Chemistry at University College from 1902 to 1928, when he retired. During that period he conducted important researches into the effects of high-potential electric discharges upon gases at low temperatures.

Mr. F. P. Whitaker.—We regret to announce that Mr. Frank Percy Whitaker died at his home in Rugby on October 26th. He was well known in engineering circles on account of the work he did in the development of rotary convertors, on which he was regarded as an authority. Mr. Whitaker, who was born in London in 1883, was educated at the Roan School, Greenwich, and the Central Technical College, Finsbury. He joined the switchboard engineering staff of the British Thomson-Houston Co., Ltd., Rugby, in 1902 and after two years he left to join the staff of Dick, Kerr & Co., Ltd., Preston. In 1906 he returned to Rugby and entered the B.T.H. Co.'s DC Machine Department, where he ultimately specialised in the design of large DC machines and rotary convertors, doing also some of the pioneer work in the development of mercury arc rectifiers.

Mr. J. D. Nettleton.—We reported in our October 16th issue that Mr. J. D. Nettleton, lighting engineer and area manager in Lancashire and Cheshire to Benjamin Electric, Ltd., had met with a serious accident. We regret to hear that he died on October 28th. Mr. Nettleton served his apprenticeship with Thomas Green, Leeds, and later had power station experience. He was with Siemens for a time and joined Benjamin Electric eighteen years ago.

Will.—The late **Mr. C. F. J. Tranter,** a director of J. H. Tucker & Co., Ltd., left estate valued at £107,050 (£106,245 net personalty). He made bequests to Birmingham hospitals.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Alloy Nomenclature

AT one time a brass was an alloy of copper and zinc and a bronze an alloy of copper and tin, but nowadays the two words seem to be used indifferently for any alloy containing copper. Some confusion was inevitable, I suppose, when literally hundreds of special property copper alloys were produced to meet the growing demands of the engineer. Confusion is usually avoided by the use of some such term as "cartridge brass" or "high tensile brass" and everyone knows what is meant.

Nevertheless, I feel that the use of the word "spelter" to mean an alloy of copper and zinc used for brazing is much to be deplored. It appears in "Microfarad's" article on "Brazing Practice" in your issue of October 23rd. Since he refers to the B.S.I. grades why not use the B.S.I. name, *viz.*, "brazing solder"? Spelter is used in B.S.S. to mean a grade of substantially pure zinc and I think most metallurgists would use the word in that sense.

Wickford, Essex. P. E. TAYLOR, B.Sc.

The Case for Overhead Lines

I WAS rather surprised to see the remarks of the chairman of the Transmission Section of the I.E.E. in his address, and I am very glad to see Mr. Watsham's letter in your issue this week. I know there is a great controversy about overhead as against underground transmission, but so far as I know the former is far cheaper and a great many people in the country would not be enjoying electrical service if it had not been for overhead lines.

I am speaking from the point of view of a wood pole supplier and think that I can consider myself one of the pioneers in this line and from what I gather from friends the maintenance of wood pole lines is not excessive and the percentage of breakdowns is small. I believe that for moderate size lines, or even large ones, it is the general opinion of people who know, that a wood pole line takes a lot of beating, and that overhead lines generally have been "a boon and a blessing to men."

Bedford. CHRISTOPHER WADE, A.M.I.E.E.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

DURANCE floor polisher.
Linaglow, Ltd.

INSTITUTION PROCEEDINGS

Ministry of Fuel. Guernsey Radio Link

The Fuel Industries

SPEAKING at the recent annual general meeting of the FUEL LUNCHEON CLUB, Sir David Milne-Watson, who remains as president for another year, said that when he suggested the establishment of a Ministry of Fuel and Power last year he was somewhat severely criticised by certain writers in the technical Press. He was represented as one connected with a dying industry or one that ought to die even if it showed no signs of doing so, and saw the Ministry of Fuel as a kind of nurse to preserve the particular branch of fuel with which he was associated. But there could now be no doubt that there was need for a Minister whose whole time was available to give the fuel industries the attention they required and to co-ordinate them in the national interest.

After the war, the country would be poorer and it would be necessary to make the most of our national resources. Coal was the greatest national asset and it would be necessary to determine which forms of fuel were the best for particular purposes and how they should be used.

Although everybody desired to have freedom of choice, it was questionable whether we could afford to give either the domestic or industrial user this freedom. There were some, no doubt, who would say there was one fuel which could do everything, but it would be a great mistake if that view found acceptance—and he did not think it would. The problem would be to give freedom of choice without incurring too great expense. To fit a house up to use gas, electricity or coal might involve some additional expense in the first instance, but it might be economical in the long run if consideration were given to the vital question of national efficiency.

Co-ordinated Research

Coal was the basis of both the gas and electricity industries and the tendency in the future would be more and more to turn coal into these two commodities. Much research had been carried out on coal and perhaps in the future this would be united with the research being carried out by the gas and electricity industries, because it was all a problem of how to make the best use of our national fuel—coal. If the gas industry were destroyed it would be necessary for the Government to start a new gas industry having regard to the value of the by-products. Electricity had a monopoly in certain directions, such as lighting and power, but that did not mean that it should try to crush out the other industries from fields where they could, and did, give most efficient service.

Under the stress of war there was a truce to competition between the various branches and surely no one wished to see a reversion to a wild scramble for business again after the war. As one connected with the gas industry he was not complaining of what had happened in the early days, because electricity, as a newcomer, had to fight for a place and could never have got where it was without a struggle. It had been alleged that without competition progress would die. Competition had its uses, but it ought to be controlled—by themselves chiefly—in the national interest.

Surely they could conceive the Ministry of Fuel and Power acting as a guiding influence in this most important department of national life, and it was the joint responsibility of those engaged in the fuel industries to co-operate and pool their experiences for the benefit of the new Ministry to prevent its making mistakes.

Cross-Channel Radio Telephony

A STUDY of propagation over the Post Office radio-telephony link between Guernsey, Channel Islands, and Chaldon in England on 5 and 8 metre wavelengths is described in a paper by Dr. R. L. Smith-Rose and Miss A. C. Stickland (National Physical Laboratory) presented to the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS.

The authors survey field intensity measurements over a path about 85 miles in length almost entirely over the sea, of which some 36 miles is outside the optical range. The data recorded have been analysed in such a way as to illustrate the general and detailed variations of received signal strength and the manner in which they are dependent on various atmospheric conditions. While fading has been similar on the two wavelengths, there is a difference in the secular variation of the amount of fading at 60 and 37·5 Mc/s.

No diurnal or seasonal change of signal intensity has been noted, however, nor any definite diurnal change in the amount of fading. That observed has been of various forms, ranging from a rapid type in which changes occur more or less periodically every three or four minutes, to a slow type extending over one or more hours. The latter kind is usually accompanied by a high level of signal intensity interrupted at long intervals by

rapid and deep fading lasting from 10 to 30 minutes.

The field strength records exhibit marked correlation between periods of negligible fading and the existence of low atmospheric pressure generally, including lack of appreciable temperature inversion. The occurrence of fog and snow has a similar effect to that due to the prevalence of low pressure. The conclusion is that abrupt changes of temperature and water vapour gradients in the atmosphere cause signal variations in good weather, while the absence of those discontinuities in bad weather allows the signal to remain steadier.

The results appear to confirm and supplement other studies, notably in America, of the propagation of ultra-short waves. It seems clear that the main agencies causing change of signal intensities on these wavelengths are the variation of the refractive index of the air in the lower atmosphere, due notably to changes in moisture content, in addition to the presence or absence of temperature inversion layers from which the waves can be reflected at heights of from a few hundred to a few thousand feet.

The Theory of Units

ABOUT a hundred and fifty members and visitors listened to a paper submitted recently to the London section of the British Institution of Radio Engineers by Mr. L. H. Bedford in which he describes a method of correlating the various systems of units used in electromagnetic theory. The author dislikes the customary practice of immediately reducing arbitrary constants, which are conveniently introduced for the purpose of defining units, to unity in order to dispose of them, although they must frequently be painfully reintroduced at a later stage. He prefers to retain such constants, giving them values (which can be tabulated when their derivation is understood) that permit their transfer from one system of units to another in a simple manner.

Farming Methods

IT has been customary for presidents of the INSTITUTION OF CIVIL ENGINEERS to deal in their addresses with the branch of engineering with which they have been especially associated, but Sir John Thornycroft, K.B.E., this year's president, says that as his work has been so closely connected with the Navy and, to a smaller extent, with the Army, he considers that, under present conditions, it is inadvisable to talk about it. Therefore, for his address delivered on Tuesday last, he selected as his subject engineering in agriculture—a matter in which he has taken a great personal interest for many years.

The address deals in detail with the problems of land drainage, soil erosion and the application of steam and internal-combustion engines to tractors and farming machinery—ploughs, machines for sowing seed in drills and for planting root crops and potatoes, and harvesting machines. The importance of research is emphasised and mention is made of the establishment by the Government of the Agricultural Machinery Development Board and of an Institute of Research in Agricultural Engineering. The application of electric power is discussed and its extension is urged, with a suggestion that town dwellers and industrialists should be charged an overriding percentage so that supply authorities would be able to distribute electricity to every agricultural holding at the low prices available to town dwellers.

I.E.E. London Students

THE London Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS opened the 1942-3 session last month with a "Brains Trust" meeting. The "brains" consisted of senior members of the Institution whose answers to the technical questions were models of clarity and conciseness, while their humorous treatment of some of the more general questions produced much laughter. The meeting was a great success, and even the members of the "Trust" were understood to have found the evening much less nerve-wracking than they expected. The attendance of 185 was the largest since 1935.

On the following Saturday the first dance of the session was attended by about 100 members and friends who spent an enjoyable afternoon at the Lysbeth Hall, W.1.

Standards Institution

SIR Percy Ashley (chairman) reported at the annual meeting of the British Standards Institution that the Government had recognised the Institution as the body for the issue of national standards with the exception of those issued by the Medical Research Council in the British Pharmacopœia and Codex. Since the last meeting the Institution had published 160 new and revised standards making the total issued 1,300. These included war emergency specifications prepared at the request of the Ministry of Aircraft Production, Board of Trade, Ministry of Home Security and Ministry of Supply. British Standard Specifications were the result of the voluntary work of some 8,000 representatives of most of the industrial and trade organisations in the country.

Railway Signalling

A MEETING of the Railway Engineering Division of the INSTITUTION OF CIVIL ENGINEERS will be held at the Institution, Great George Street, Westminster, S.W.1, on Tuesday, November 17th, 1942, at 5.30 p.m., when a paper entitled "Railway Signalling and Communications," by Mr. A. E. Tattersall, M.I.E.E., will be discussed. Members of the Institution of Electrical Engineers are invited to be present, and any who desire to attend should send their names to the Secretary of the I.E.E.

Selection and Guidance

The Equipment of the Engineering Student

METHODS of determining the aptitude of entrants to the engineering profession and affording them proper guidance in their careers form the main theme of Mr. W. Sutcliffe as chairman of the Scottish Centre of the INSTITUTION OF ELECTRICAL ENGINEERS. As a preliminary Mr. Sutcliffe quotes the charters of the leading engineering institutions to define the nature of engineers and engineering and refers to their insistence that corporate members shall have the requisite training and experience. Engineering ingenuity has been turned to base uses, but the remedy for this is not the halting of scientific progress, but the moral and spiritual regeneration of mankind.

Recruits to engineering should preferably be selected from those naturally gifted with an engineering mentality, who are not so abundant as may be assumed. Selection could be made with greater confidence if suitable tests could be applied. Some of the larger employers who regard such tests as important employ trained staff for the purpose. Tests have also been devised by the National Institute of Industrial Psychology. Recruits must possess a satisfactory standard of general education and tests should be applied to ensure that they possess "machine sense"—ability to understand how a machine works; manipulative ability, and "spatial sense"—ability to imagine and think in three dimensions. Mr. Sutcliffe gives some details of the different tests employed to ascertain whether young men possess these qualities.

Engineers and Æsthetics

In the next section of his address Mr. Sutcliffe studies the attitude of engineers towards æsthetics. They sometimes rightly attribute unpleasing designs to the pressure of price competition, but sometimes they wrongly maintain that a design which is technically right should please the eye. Electrical machinery and equipment can be given an agreeable aspect without sacrificing any scientific principle or impairing "dollar efficiency" ideals if the designer exercises a little care and co-operates with any others concerned in the production of the complete unit. Fine examples of balanced design of turbines, exciters and alternators can be seen in some of our modern power stations. Switchgear presents more difficult problems, although some recent designs show a great improvement in appearance. Deep down in the heart of all engineers, Mr. Sutcliffe says, is a respect for harmony of expression in machinery design.

Vocational guidance is next studied and the view is expressed that the student may better be advised to pursue the more difficult upward way than to enter upon an alluring path which is often strewn with pitfalls. University or college curricula might with advantage include a course of lectures to advanced students on possible careers and the nature of the work involved in them. Nowadays many entrants into industry appear to have little definite ideas as to the planning of their careers. It is not meant that undergraduates should be instructed in detail in special directions, but that broad views should be given to inculcate clearer conceptions of various branches of the profession.

Requisite Attributes

The importance of team work is stressed. Mr. Sutcliffe cites an American example in which the collaboration of ninety contributors in the development of an unconventional type of transformer resulted in a design showing a very considerable saving in weight, floor space, height and oil. The same source is quoted as stating that an engineer should possess fifteen faculties to achieve success. They are "constructive discontent," originality of vision, courage, specific knowledge, general knowledge, analytical ability, ability to synthesise, common sense, enthusiasm, persuasiveness, perseverance, energy, initiative, a sense of humour and "co-operativeness."

The relations of the engineer to the community are considered in the concluding section. The principal attributes of the engineering mind are powers to observe, to analyse, to deduce, to correlate, to devise, to apply and to plan ahead, and it is pertinent to ask whether these are not the basic faculties required by those who are called upon to direct our national policy. If this is agreed, should the engineer express his views and suggest new methods of approach to the solution of national issues, on lines not unlike those which he follows when dealing with engineering problems? After quoting the views of Lord Weir and the late Professor Miles Walker, Mr. Sutcliffe favours Lord Weir's suggestion that a closer approach between the scientist and engineer and those in control of national policy might provide a solution.

Tariffs and Metering

In last week's abstract of Mr. E. H. Miller's address as chairman of the I.E.E. Measurements Section we referred to his suggestion that the basic price should not exceed 0·5d. per kWh. Owing to a printer's error the price was given as 6·5d. per kWh.

COMMERCE and INDUSTRY

Appliance Export Licensing. Brazing Practice.

Fuel Economy

IN common with other boroughs Hull has launched a "Battle for Fuel" Campaign, and the local electricity and gas showrooms are holding exhibitions and demonstrations to show the public how fuel can be saved in the form of coal, electricity and gas. At the electricity showrooms a comprehensive display has been arranged with appropriate slogans and posters on the walls. At the opening of the campaign the Lord Mayor of Hull said that as a result of propaganda and advertisement there had already been an appreciable saving in the consumption of electricity.

Commander King-Hall, M.P., chairman of the Fuel Economy Publicity Committee, recently visited Belfast and outlined the details of the Fuel Economy Campaign to representatives of both electricity and gas undertakings, who explained their difficulties of coal supply, both as regarded quality and quantity. Later, at a Press conference, Mr. Cooke, Regional Coal Officer, revealed that eighteen full-time supervisors has been appointed to detect waste of light, power, heat or fuel. Anyone guilty of waste would be liable to prosecution.

Waste-Paper Recovery

Satisfactory results are accruing from the initial appeal to the electrical industry to make a special endeavour to salvage all waste paper. Among outstanding items mentioned by the Electrical Industry Waste Paper Recovery Committee (2, Savoy Hill, W.C.2) are that the British Thomson-Houston Co., Ltd., has turned out 40 tons and that Ferranti, Ltd., are having waste paper collected at the rate of 15 tons per month.

Of course, many electrical concerns had already made satisfactory arrangements for the recovery and collection of their paper. It is hoped that they will indicate to the Committee the volume thus dealt with and also that some of them, at least, will pass on the proceeds to the Electrical Industries Benevolent Association, as suggested in the Committee's original appeal.

If any electrical company (or individual) has been unable to arrange for the regular collection of waste paper a word to the Committee will put things right.

Production of Hand Tools

The Directorate of Hand Tools, Ministry of Supply, which is already concerned with the provision of Service supplies and the allocation of raw material for hand tools, is to take over the responsibility for planning the production of all hand tools. Production plans will be worked out for the various sections of the industry and steps will be taken as necessary to correct defects in distribution. The Director of Hand Tools will be assisted by advisory panels familiar with the production and distribution problems of distinctive sections, and will have the collaboration within the Directorate of qualified honorary advisers from a number of the principal branches of the industry. Cases of difficulty in obtaining essential requirements for industrial and agricultural purposes should therefore be submitted to the Director of Hand Tools, Ministry of Supply, Tettenhall, Wolverhampton. The new arrangements will mean the elimination of unnecessary tools and finishes, standardisation wherever this can lead to economies or to increased production, and a general direction over distribution so that supplies may be made available in the right places and at the right times.

Control of Cooking and Heating Appliance Exports

Under the Export of Goods (Control) (No. 41) Order, 1942 (S.R. & O. 1942 No. 2185, price 1d.) which comes into force on November 16th, control is extended to cover, *inter alia*, additional types of cooking and heating appliances. Licences will in future be required to export the following electric cooking and heating appliances, and parts and accessories therefor, wholly or mainly of metal, to all destinations :—

Bains-marie, cookers, cooking ovens, food steamers, grillers, heating plates, hot-cupboards, plate warmers, toasters and waffle plates ; boilers, boiling plates, boiling rings, boiling tables, coffee percolators, steam raisers, urns and water heaters, including electrode and immersion heaters ; convectors, radiators, towel rails and tubular heaters , ranges, stoves and grates ; and any combinations of the above.

The existing licensing requirements relating to goods of these descriptions wholly or mainly of iron and steel, and which do not cover those of a kind used for manufacturing purposes, are superseded by the provision that licences will in future be required to export cooking and heating appliances and parts wholly or mainly of metal, and appliances used for manufacturing purposes are no longer excepted from control.

Disused Tramway Rails

So that all old and disused tramway rails shall be treated as re-melting scrap the Minister of Supply has issued the Control of Iron and Steel (No. 25) (Scrap) Order, 1942, which comes into force on November 3rd. The Order provides that no person may use tramway rails, except as part of a railway or tramway track or as scrap for re-melting, unless licensed by the Minister of Supply. Copies of the Order may be obtained from the Stationery Office, York House, Kingsway, W.C.2, price 1d.

Electrical Brazing

To the series of memoranda issued by the Advisory Service on Welding, Ministry of Supply, Berkeley Court, Glentworth Street, London, N.W.1, there has been added No. 9, which is illustrated and deals with six brazing processes, the equipment, alloy and fluxes employed as well as the design and strength of

joints made by this means. Advice is included on electric resistance brazing with the aid of spot, butt, or seam welders suitably tooled with carbon or copper-alloy electrodes and timed for the purpose. Machines specially built for the resistance brazing of small parts are now coming into use. In the case of dip brazing excess metal remaining after immersion in the bath is usually "rotted off" electrolytically.

Welding Nickel Alloys

An illustrated reprint (M.X. 20) of information already published on the welding of nickel as well as Monel and Inconel is obtainable from Henry Wiggin & Co., Ltd., Grosvenor House, Park Lane, London, W.1. The authors deal with the influence of electrode size and shape, the effects of temper and grain size, the cause of porosity and means of controlling it, while a method of measuring distortion produced by welding is described; useful advice on procedure and precautionary measures is included.

Belfast Electricians Return

Negotiations which took place last week resulted in the executive of the Electrical Trades Union issuing an instruction to the strikers at a Belfast engineering works, and others who had come out in sympathy, to resume work immediately. The men resumed work on the following day. It is believed, says our Belfast correspondent, that the employment of the non-union man at the engineering works, which gave rise to the strike on September 24th, is still to be investigated and that in the meantime a certain course of action has been taken.

Protest Against Waste Charge

When a charge of contravening the Waste of Fuel Order, 1942, was brought against a shopkeeper at Kilmarnock (Ayrshire) Sheriff Court, an agent referred to the prosecution as "a type of pin-pricking." The complaint was that respondent between 9.30 p.m. on October 9th and 1 a.m. on October 10th caused a waste of electricity by neglecting to switch off an electric light, which burned while the premises were empty. A plea of "guilty" was tendered by the agent.

The prosecutor said the lamp was a 50-W one, but the agent said that it was a little light inside a box in the window to show that the place was open. The lamp in use in the box was a "dim-light" bulb made specially for the purpose and was only 15 W. He could hardly believe that this sledge-hammer regulation was for the purpose of breaking a nut of this size. The agent had difficulty in seeing what public interest was served in the circumstances.

A fine of 10s. was imposed, with the alternative of five days' imprisonment.

Claim Against Electrical Contractors

At Liverpool Assizes on October 30th, Sir Lindsay Parkinson & Co., Ltd., public works contractors, claimed an indemnity against two electrical sub-contractors, following the death from electric shock of George Wharton, a labourer, employed by Parkinsons. It was stated that the work of P. J. Frampton, Ltd., Blackpool, was to erect and install temporary power lines from h.v. mains to an ordnance factory site and to maintain them. The contract of Albert E. Sudlow & Co., Ltd., Manchester, was permanently to complete all wiring, lighting, etc., and to maintain it. In February, 1941, Wharton went into an air-raid shelter, came into contact with fittings temporarily installed several weeks before and was killed. Parkinsons paid £600 under the Workmen's Compensation Act and now sought to recover this sum from the sub-contractors on the ground of breach of express or implied contract. The temporary lighting wiring was put in by Sudlow & Co.'s foreman and it was said to be defective. Judgment was given against Sudlow & Co., who were ordered also to pay Messrs. Framptons' costs.

Machine Tool Fixtures

Leaflet No. 7, "Essentials of Good Fixture Design," issued by the Machine Tool Control, 35, Old Queen Street, S.W.1, illustrates photographically and with drawings methods of locating and clamping work in machine tools. The essentials are set out in a series of succinct notes which should prove of great help in setting up the machines.

A Norwich Appointment

We are asked to state that the last date for the receipt of applications for the position of mechanical maintenance engineer in the Norwich Electricity Department is November 21st and not December 14th as stated in an advertisement which appeared in our issue of October 30th.

Liabilities in War Time

The Liabilities (War-Time Adjustment) Act, which came into force in 1941 (the provisions of which were reviewed in our issue of May 30th, 1941) was designed to assist the small trader who has been adversely affected by the war. It would appear, however, that many traders who are eligible have failed to take advantage of the Act. At a Press conference held last week, Capt. C. Waterhouse, Parliamentary Secretary to the Board of Trade, emphasised the willingness of the local Liabilities Adjustment Officers to help people who are in difficulties. No fees are charged for advice given, and all information given to officers is treated as strictly confidential.

Traders who would like information about the Act should apply to the local Liabilities Adjustment Officer whose address can be obtained from the Registrar of the County Court.

Commercial Travellers' Benevolent Institution

The annual court of governors of the above Institution is to be held at 4b, Frederick's Place, Old Jewry, London, E.C.2, on Tuesday, December 29th, at noon.

Engineering Bulletin

The monthly publication hitherto issued by the Ministry of Labour and National Service under the title "Engineering Bulletin" has become the joint care of that Ministry and the Ministry of Production. It has been expanded and renamed "Production and Engineering Bulletin." Mr. Oliver Lyttelton, Minister of Production, says in a foreword that the purpose of the section for which his Department is

responsible is to give new suggestions and ideas to help those in industry.

The articles included in the October issue deal with the regional organisation of the Ministry of Production ; the heat treatment of molybdenum high-speed steel ; various aspects of machine-tool operation ; foremanship ; weight lifting and carrying ; the British Standards Institution, etc.

Poppy Day

Next Wednesday (November 11th) is the British Legion's Poppy Day on which the nation is asked to help in the Legion's work on behalf of men disabled in the service of their country. Last year over three-quarters of a million pounds was collected, a good figure but not too much to meet the added responsibilities brought about by present circumstances. We commend this good cause to the attention of our readers and ask them to give all they can.

Cable Makers' Wages

The latest Ministry of Labour cost-of-living figure will not involve any alteration in wages in the electrical cable making industry on the third pay-day in November.

Changes of Address

Electricals, Ltd., have removed to 14, Claremont Place, Newcastle-on-Tyne, 2.

C. E. Reed & Co., Ltd., have removed to Carter Lane, Victoria Street, Bristol, 1. The telephone number is unchanged.

Cooker Standardisation

The Gas Industry's Views

As the standardisation of electric cookers is a subject that has been raised again recently it is of interest to learn of the activities of a committee set up by the Institution of Gas Engineers to study the general question of standardising domestic gas appliances. The first part of this committee's report, recently published, deals with cookers, and, according to the *Gas Times*, no evidence was given before the committee of collaboration between independent undertakings in the creation or adoption of a common standard modern cooker. All witnesses were in favour of some measure of standardisation but most of them agreed that total standardisation should be limited to appliances suitable for supplying to prepayment consumers, leaving the field of the high grade cooker free for research and development.

Manufacturers' Co-operation

A representative of the gas stove makers said that they had a panel which had been considering for some time the possibilities of simplifying and rationalising some component parts and agreement had already been reached about a number of items. He also mentioned that reputable makers of appliances had spent large sums on research and development and in service to gas undertakings. Other makers who had not incurred these expenses would be able to sell a standardised cooker at a lower price. It was considered that complete standardisation would not necessarily result in any substantial reduction in price beyond that which could be attained by ensuring large enough orders for makers' existing standard models. Witnesses in favour of national standardisation were not able to offer a solution to the problems of designing and producing a nationally standardised cooker and securing its acceptance by the gas industry.

The committee comes to the conclusion that there is no general measure of agreement in the gas industry in favour of a nationally standardised cooker and it sees no prospect of agreement while the structure of the gas industry and the diversity of outlook of the component units remain as at present. At the moment no medium exists for the discussion of such matters of common interest to all members of the gas industry. There is general agreement that a measure of rationalisation is desirable.

The committee says that a modern vitreous enamelled cooker of low price is needed to replace existing black cookers and will be required in large numbers after the war for installation in new property. Initial cost is a very important consideration but good performance, sound construction, ease of cleaning and attractive appearance are also essential.

Several general recommendations are made. The first is that steps should be taken to put into effect as soon as possible a policy of rationalisation to be applied to all new designs and with a view to giving this effect it is proposed that each manufacturer should make the component parts of his own series of cookers interchangeable to the maximum extent and each should reduce the number of models in current production to the minimum. The number of sizes of all domestic cookers should be confined to four, with a limit of three sizes for the lower-priced models normally supplied to prepayment consumers. All gas undertakings should agree not to ask manufacturers to make minor alterations and all manufacturers should agree not to make any such modifications to their standard series of cookers to suit individual buyers. Alterations of existing models and the introduction of new ones should be undertaken only when this is justified by improvements of real merit.

The remainder of the committee's recommendations are concerned with details of construction but one is worth noting. It is that the height of the hotplate should be standardised in relation to other units of kitchen equipment. This should preferably be specified by the Directorate of Post-War Building.

Brazilian Tariff Modification

THE Commercial Counsellor to H.M. Embassy at Rio de Janeiro has forwarded a translation of a Government decree of July 25th, and effective thirty days after that date, which increases the import duties on electric motors (tariff No. 1831c) to double the former rates on small motors and to treble the rates on medium sized types.

ELECTRICITY SUPPLY

Reducing Peak Loads. Minimum Charge Decisions.

Birkenhead.—PEAK LOADS.—The Electricity Committee is to appeal to the public to economise in electricity consumption from November to February, particularly during the peak load periods between 7.30 and 9.30 a.m. on weekdays and between 10 a.m. and 2 p.m. on Sundays.

The Committee is relaxing the restrictions on the use of electricity by industrial and commercial consumers whose supplies are subject to limitation during peak-load periods for such time as the maximum demand remains below that experienced during January last.

Cheltenham.—OVERHEAD LINE.—The Electricity Committee is seeking permission to provide an overhead line to a farm.

Coventry.—MAINS AND SUBSTATION EQUIPMENT.—The Electricity Committee is seeking sanction to loans for mains and substation equipment.

Glasgow.—ECONOMY AND LOAD.—Mr. Lewis G. B. Forbes, Regional Controller of the Ministry of Production, presiding at a meeting in Glasgow on October 22nd held by the regional board of representatives of electricity supply organisations and certain large industrial consumers in the West of Scotland, emphasised that the elimination of waste embraced not only the restriction of use, but also the spreading of load as evenly as possible throughout the day, thus effecting economy in fuel and saving of plant. Industrial companies were willing to assist in every way possible, but in order to prevent undue interference with war production the household consumer must play his part. The householder should use electricity only when absolutely necessary, and even then should refrain from using it during the morning when industrial demand was at its highest and must be met.

MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £4,100.

Heston and Isleworth.—HOUSEHOLDERS' ECONOMY.—At last week's meeting of the Borough Council (electrical engineer, Mr. S. H. Fowles), the chairman of the Electricity Committee remarked that the Ministry of Fuel and Power would be gratified to learn that domestic users of electricity were consuming a million kWh a month less than they did in the corresponding period of last year. During September last they used only 6·5 million kWh.

London.—REVISED MINIMUM CHARGES.—In view of the Electricity Minimum Charges Order and General Direction, 1942, the Fulham Electricity and Lighting Committee proposes to revise existing charges as follows :—No. 2 rate (⅝d. per kWh plus hire charges ; heating and cooking, wired by Council) and No. 4 rate (⅝d. per kWh plus hire charges ; "all-in" lighting, heating and cooking, wired by Council) : Minimum of 150 kWh per quarter to be reduced to 480 kWh per annum. No. 5 rate (ordinary lighting, 3½d. per kWh) and No. 7 rate (rental lighting, wired by Council) : Minimum of 3s. 4d. for each summer quarter and 6s. 8d. for each winter quarter altered to 25s. per annum, calculated at the end of each year. It is considered that the small increase from 20s. to 25s. is justified in view of the fact that the consumption during the winter as well as the summer quarters will be taken into consideration before the minimum is imposed.

FUEL ECONOMY.—Reporting on recent fuel economy propaganda in the borough, Fulham Electricity and Lighting Committee reveals that the actual saving of electricity in Fulham during the period from July 1st to the week ending October 10th, as compared with the corresponding period of last year, was 474,407 kWh.

BATTERSEA.—Sanction has been obtained by the Electricity Committee to borrow £2,215 for the installation of two batteries at the power station.

Manchester. — MODIFIED LIGHTING. — The Highways Committee reports that the system of modified street lighting employs 4,494 gas lamps and 3,995 electric lamps. Gas used increased from 32,032,000 cu. ft. to 70,685,000 cu. ft., and electricity consumed from 301,152 to 407,405 kWh.

Morley.—MINIMUM CHARGE ALTERATION.—The Electricity Committee has decided that, in consideration of the recent Order restricting minimum charges, the present minimum charge of 5s. per quarter to flat-rate consumers shall be replaced as from October 1st, by a minimum charge of £1 per annum.

Oban.—TARIFF CHARGES.—Recommendations of a sub-committee appointed to consider the charges for electricity have been unanimously adopted by the Lighting Committee. One proposal was that the present two-part tariff should be abandoned in favour of a two-rate system. Charges for different classes of premises and rates for motive power have also been fixed. In the case of premises de-rated under the Local Government (Scotland) Act, 1929, the charges are to be based on the gross annual value appearing in the Valuation Roll and not on the rateable value. Meter rents are to be abolished and the minimum charge is to be for 60 primary kWh per annum (*i.e.*, £1).

Oldham.—ANNUAL MINIMUM.—As the Electricity Committee already operates the minimum charge of £1 on an annual basis no change will be necessary to comply with the recent Order.

Raunds (Northants).—SUPPLY TO WATER PUMPING STATION.—The U.D.C. is to execute a supplemental agreement with the Rushden & District Electric Supply Co., Ltd., to provide for a larger transformer and increased rental in connection with the supply of electricity to the Council's water pumping station.

South Shields.—WITHDRAWAL OF MINIMUM CHARGE.—The Electricity Committee has decided to abolish the minimum flat rate charge for the duration of the war.

EMPLOYMENT OF WOMEN.—In response to a circular from the Electricity Commissioners regarding the employment of women at electricity works, the Electricity Committee has reported that it is not expected that women

will be employed by the undertaking during the present financial year.

CHANGING TO FLAT RATES.—When the Electricity Committee considered the question of consumers being allowed to change from two-part tariffs to flat rates while the necessity for fuel restriction remained, the borough electrical engineer pointed out that only a small number of consumers would be affected and that the sum involved would be small. It was agreed that consumers should be allowed to change wherever it was advantageous to them.

SUPPLY TO PUMPING STATION.—The Town Council has rescinded its decision to increase by 10 per cent. the " unit " charge for electricity supplied to a pumping station of the Sunderland & South Water Co., Ltd. The company had proposed to seek arbitration.

Southend-on-Sea.—NO MINIMUM CHARGE.—At a recent meeting of the Electricity Committee consideration was given to the Order regarding minimum charges and also to a suggestion made by Councillor Dyer that the " all-in " domestic rate fixed charges should be altered to encourage economy. The minimum charges on several domestic tariffs have already been discontinued, and it was decided that no action should be taken to enforce payment of the charge of 25s. permitted by the Order. With regard to the " all-in " domestic tariff fixed charge it was felt that no alteration could be made.

Tynemouth.—MINIMUM CHARGE DECISION.—Following consideration of the Electricity Minimum Charges Order and General Direction 1942, the Town Council has agreed that in future there shall be an annual minimum charge of £1 in the case of consumers affected by the minimum charge which is operated by the Corporation.

Forthcoming Events

Institution of Electrical Engineers.—Monday, November 23rd, 5.30 p.m. Informal discussion on " The Electronic Control of Industrial and Power Plants," to be opened by Mr. S. G. King.

Transmission Section.—Wednesday, November 11th, 5.30 p.m. Informal discussion on " The Technical Implications of the Scott Report as Applied to Electricity Supply," to be opened by Mr. J. A. Sumner.

Installations Section.—Thursday, November 12th, 5.30 p.m. Paper : " Voltage Surges caused by Contactor Coils," by Messrs. J. R. Taylor, B.Sc.(Eng.), and C. E. Randall.

South Midland Students' Section.—Saturday, November 7th. Visit to Queen Elizabeth Hospital, Birmingham. Wednesday, November 25th, 6.30 p.m. James Watt Memorial Institute, Birmingham. Paper : " Reactive Power Metering," by Mr. C. W. Westwood.

North-Western Centre.—Saturday, November 7th, 2.30 p.m. College of Technology, Manchester (not Engineers' Club as previously announced). Paper : " Telecommunications of the Future," by Dr. W. G. Radley. *Students' Section.*—Saturday, November 14th, 2.30 p.m. Engineers' Club, Albert Square. Paper : " Electricity Applied to Coal Face Mining Machinery," by Mr. D. H. Coles, B.Sc.

North-Eastern Centre.—Monday, November 9th, 6.15 p.m. Neville Hall, Westgate Road, Newcastle-on-Tyne. Paper : " The Soot Blower," by Mr. R. J. Glinn. *Students' Section.*—Friday, November 20th, 6.30 p.m. Neville Hall. Paper : " Fires in Electric Power Stations," by Mr. M. A. Tucker.

Scottish Centre.—Tuesday, November 10th, 6.15 p.m. Societies' Room, Royal Technical College, George Street, Glasgow, C.1. Joint meeting with the West of Scotland Branch of the Iron and Steel Institute. Informal paper: " Open Hearth *v.* Electric Furnaces in Steelworks," by Messrs. H. A. Sieveking and J. A. Davies. Tea, 5 p.m., at Daniel Brown's, 79, St. Vincent Street, Glasgow.

Northern Ireland Sub-Centre.—Tuesday, November 10th. Paper : " A Critical Review of Education and Training for Engineers," presented by Dr. E. B. Moullin on behalf of Post-war Planning Sub-committee No. 1.

Dundee Sub-Centre.—Thursday, November 12th. Paper : " Some Novel Production Methods," by Mr. J. Lomax.

Institution of Mechanical Engineers.—Friday, November 6th, 5.30 p.m. Thomas Hawksley Lecture " Recent Developments in Refrigeration," by Lord Dudley Gordon.

Illuminating Engineering Society.—Tuesday, November 10th, 5 p.m. E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2. Paper : " The Lighting of Docks," by Mr. T. Nisbet.

Association of Mining Electrical and Mechanical Engineers.—*London Branch.*—Thursday, November 12th, 2.30 p.m. Junior Institution of Engineers, 39, Victoria Street, S.W.1. Address by the new branch president, Mr. B. N. Dunster.

South Wales Branch.—Saturday, November 7th, 5.45 p.m. South Wales Institute of Engineers, Park Place, Cardiff. Discussion on the presidential address " Post-war Training for the Engineer Apprentice," to be opened by Mr. G. Henderson, A.M.I.E.E.

Institute of Fuel.—Thursday, November 12th. 2.30 p.m. Connaught Rooms, Kingsway, London, W.C.2. Paper : " The Provision of Smokeless Fuels for Post-war Reconstruction," by Dr. G. E. Foxwell.

Midland Branch.—Saturday, November 14th. 2.30 p.m. Grand Hotel, Birmingham. Opening meeting of branch. Discussion on " The Battle of Fuel in Industry : How is it Going ? " to be opened by Dr. E. W. Smith. Members of other technical societies are invited.

Junior Institution of Engineers.—Friday, November 13th, 6 p.m. 39, Victoria Street, S.W.1. Annual meeting. Friday, November 20th, 6 p.m. Informal meeting. Paper : " Appointments Department within the Ministry of Labour and National Service."

Association of Supervising Electrical Engineers.—Saturday, November 14th, 2 p.m. Lecture : " Infra-red Heating for Paint Drying and other Industrial Applications," by Mr. F. E. Rowland, A.M.I.E.E.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Ferranti, Ltd., report a profit on trading, etc., for 1941-42 of £149,855 (after providing for taxation), as compared with £172,155 in the preceding year. A balance of £74,482 brought forward is added, making £224,337. After meeting depreciation, directors' fees, war damage insurance and preference dividends there remains a balance of £102,949. From this £10,000 (against £20,000) is transferred to contingency reserve and a 6 per cent. (free of tax) dividend is again paid on the ordinary shares, leaving £74,949 to be carried forward. The results are considered by the directors to be satisfactory.

The Jerusalem Electric & Public Service Corporation, Ltd.—Presiding at the annual meeting held on October 28th, Mr. W. Shearer (chairman) said that, despite the continuance of increased costs and lighting restrictions and the uncertainty due to war conditions in the Near East, the accounts for the year ended March 31st, 1942, showed a rather more favourable result than in the previous year, the operating surplus amounting to £P73,033, as compared with £P66,631 in the preceding year.

The available balance on profit and loss account, after bringing in £P9,386 from the previous year, was £P76,653. Preference dividend and appropriations, including £P21,005 for taxation, £P5,477 for capital amortisation, £P21,500 to plant renewal and depreciation account, and a further allocation of £P4,000 to the war contingency account, absorbed £P60,351, leaving a balance of £P16,301. The dividend of 5 per cent. on the ordinary share capital required (less income tax) £P6,539, leaving to be carried forward to the next year's account £P9,762.

The plant and distribution system had operated satisfactorily throughout the year. No plant extensions had been undertaken during the year other than minor improvements and alterations in the distribution system.

The Mexico Tramways Co. reports a loss of $410,081 (Canadian) for 1941, against a loss of $328,395 for 1940, raising the accumulated deficit to $10,008,913. Improved earnings were offset by higher operating expenses.

The St. Austell & District Electric Lighting & Power Co., Ltd., has made an offer to purchase for redemption its outstanding "A" debentures (£7,800), at a price of £52 10s. for every £50 debenture, excluding the interest which is due for payment on November 30th.

Ultra Electric, Ltd.—A meeting will be held on November 6th to consider a resolution that the 800,000 issued 5s. ordinary shares be converted into ordinary stock, transferable in multiples of 5s.

The Calcutta Tramways Co., Ltd., is again paying an interim dividend of 2½ per cent., less tax.

Chadburn's (Ship) Telegraph Co., Ltd., is paying a dividend of 10 per cent. for the past year (same).

Meters, Ltd., has announced an interim dividend of 4 per cent. (same).

New Companies

F. R. Mount & Sons, Ltd.—Private company. Registered October 20th. Capital, £500. Objects : To carry on the business of manufacturers of, and wholesale and retail dealers in, engineering and electrical apparatus, etc. Directors : F. R. De T. Mount, Gramarye, Warren Close, Esher, Surrey, and P. F. A. Grein, Rutherford, Southwood Gardens, Hinchley Wood. Solicitors : Syrett & Son, 2, John Street, London, W.C.1.

A. V. A. Battery Co., Ltd.—Private company. Registered October 20th. Capital, £1,000. Objects : To acquire the business carried on as the A. A. Battery Co. at 7, Holcroft Road, London, E.9, and the battery manufacturing business carried on by V. Shakowitz at 47, Gunton Road, London, E.5, and to carry on the business of electrical battery and torch manufacturers, etc. Directors : B. Mydat, 26, Chessington Avenue, London, N.3, and three others. Registered office : 152, Commercial Street, London, E.1.

P. A. Mudd, Ltd.—Private company. Registered October 19th. Capital, £50,000. Objects : To carry on the business of electric and general welders, welding engineers, manufacturers of, and dealers in, steel floorings and stairways, elevators, hoists, conveyors, cranes, belts, chains, cables, ropes and material-handling and labour-saving plant, wagons, motor vehicles, etc. P. A. Mudd, Hurgill House, Richmond, Yorks, is permanent governing director. Solicitor : A. I. Braid, 76, Church Street, West Hartlepool.

Midland Electric Installation Co. Ltd.—Private company. Registered October 24th. Capital, £5,000. Objects : To carry on the business of electrical, mechanical, wireless and television engineers, electricians, etc. Directors : A. R. Cotton, Wood House, Shatterford, near Bewdley, N. M. Joseph, address not stated, and R. A. Joseph, 20, Park Dale, Wolverhampton. Registered office : Cyprus Works, Upper Villiers Street, Wolverhampton.

Reman Engineering Co. Ltd.—Private company. Registered October 23rd. Capital, £100. Objects : To carry on the business of electrical, motor, civil, constructional and general engineers, etc. Directors : B. Clapham, 35, Newstead Avenue, Orpington, Kent, G. Loram, 14, Oak Lodge Avenue, Grange Hill, Chigwell, and A. Regal, 59, Freegrove Road, N.7.

Communications Patents, Ltd.—Private company. Registered October 20th. Capital, £1,000. Objects : To acquire patents and rights relating to electrical, mechanical and other means of communications, etc. Directors :

B. H. Lyon, Loxhore, Kensington Place, Newport, Mon. (director of Broadcast Relay Service, Ltd.), and P. Adorjan, Coombe Gorse, Coombe Park, Kingston Hill, Surrey (director of Rediffusion, Ltd.). Registered office : Victoria Station House, Victoria Street, S.W.1.

Process Control Gear, Ltd.—Private company. Registered October 21st. Capital, £1,000. Objects : To carry on the business of electrical and mechanical engineers, thermionic instrument and process control gear engineers, etc. Directors : A. F. Allwood, 13, Hordle Gardens, St. Albans, and R. H. Allwood, 89, Beech Road, St. Albans (directors of H. Partridge Smith & Co. (1937), Ltd.), R. H. Barbour, Westwich House, Leverstock Green, Hemel Hempstead (director of Electrical Apparatus Co., Ltd.), and C. H. Perkins, Upper Gade, Hudenhall, near Berkhamstead.

Companies' Returns

Statements of Capital

S. H. Heywood & Co., Ltd.—Capital, £34,000 in 18,000 cumulative preference shares of £1 each, and 32,000 ordinary shares of 10s. each. Return dated July 8th. All shares taken up. £20,000 10s. paid. £13,999 10s. considered as paid. Mortgages and charges : Nil.

Exeter Radio & Television Services, Ltd.—Capital, £2,000 in £1 shares. Return dated June 1st. 1,339 shares taken up. £1,339 paid. Mortgages and charges : Nil. A further 197 shares were allotted and fully called up on June 17th.

Allen West & Co., Ltd.—Capital, £700,000 in £487,500 stock and 850,000 shares of 5s. each. Return dated June 2nd. £487,500 taken up. £447,935 5s. paid. £39,546 15s. considered as paid. Mortgages and charges : £208,209.

J. B. Saunders, Ltd.—Capital, £5,000 in £1 shares (4,000 ordinary and 1,000 preference). Return dated June 4th. 4,000 ordinary and 795 preference shares taken up. £4,795 paid. Mortgages and charges : Nil.

G. L. Adamson, Ltd.—Capital, £7,500 in £1 shares. Return dated June 8th. 6,236 shares taken up. £1,736 paid. £4,500 considered as paid. Mortgages and charges : Nil.

Alert Electrical Co., Ltd.—Capital, £2,000 in £1 shares. Return dated April 15th (filed June 3rd). 711 shares taken up. £711 paid. Mortgages and charges : Nil.

Mortgages and Charges

Euston Manufacturing Co., Ltd.—Satisfaction in full on or before October 10th, 1942, of debentures authorised January 17th, 1940, and registered February 13th, 1940, securing £500.

Service Electric Co., Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated October 9th, 1942, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Schall & Son, Ltd.—Assignment on October 15th, 1942, of proceeds of certain contracts, to secure all moneys due or to become due from the company to Midland Bank, Ltd.

Milnes Electrical Engineering Co., Ltd.—Mortgage on contract moneys dated October 9th, 1942, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Vidor, Ltd.—Satisfaction in full on September 24th, 1942, of debenture dated January 14th, 1935, and registered February 4th, 1935.

Increase of Capital

Reliance (Cords & Cables), Ltd.—The nominal capital has been increased by the addition of £20,000 beyond the registered capital of £30,000. The additional capital is divided into 10,000 7 per cent. redeemable preference and 10,000 unallocated shares of £1 each. To April 18th, 1941, 300 shares of £100 each had been issued, of which W. Davis (Spitalfields), Ltd., held 298.

Receivers Appointed and Released

Electric Light Insurance & Maintenance Co., Ltd.—A. N. Hardie, of 25, Holly Park Gardens, Finchley, N.3, was appointed receiver on October 12th, 1942, under powers contained in mortgage debenture dated May 27th, 1908.

Herts Radiolectric, Ltd.—A. Harris, of 329, High Holborn, W.C.1, ceased to act as receiver and/or manager on October 14th, 1942.

Companies Struck Off the Register

The names of the following companies have been struck off the Register and they are thereby dissolved :—Vacuum Electric Geysers, Ltd. ; B. P. Electrical Co., Ltd. ; S. Richardson (Radio), Ltd.

Liquidations

National Association of Radio Retailers, Ltd.—Meeting, December 1st, at Africa House, Kingsway, London, W.C.2, to receive an account of the winding-up by the liquidator, Mr. P. C. Cavanagh.

Bankruptcies

S. V. Knight, electrical engineer, residing at 20, Faber Gardens, Hendon, London, N.W.4, and who carried on business at 10a, Watford Way, Hendon, N.W.4.—Application for discharge to be heard on November 12th at Bankruptcy Buildings, Carey Street, London, W.C.2.

H. Nutter, electrical engineer, 246, Yorkshire Street, Rochdale.—Application for discharge to be heard on December 11th at the County Court Buildings, Rochdale.

W. H. Grange (Talbot Electrical Co.), electrical engineer, 14, Plumstead Road, Thorpe St. Andrew, Norfolk.—Supplemental dividend of 1s. 0¾d. in the £, payable at Castle Chambers, Opie Street, Norwich.

New Lamp Works in Spain

According to *Metalurgica y Electricidad*, the Sociedad Espanola de Aparatos Electricos y Lamparas has received official sanction to establish works in Barcelona for the manufacture of electric lamps for motor vehicles, cinema projectors and electric signals.

STARTERS

A full range is available, including all types, for A.C. and D.C. Motors, Hand Operated, Automatic, Air, and Oil Break.

SWITCHBOARDS

Of all types, Open Flat Back Type, Enclosed, Oil Immersed Non-Drawout type, and Switchboard mounting gear.

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CIRCUIT BREAKER Design

AND OUR CONTRIBUTION TO PROGRESS

RECENT literature on circuit interruption reflects the steady advance of switchgear design and construction. It records the achievement of still greater interrupting capacities, increased safety of operation, reduced maintenance and greater continuity of service.

The part played in this progress by Elkonite arcing contact materials and their development to meet increasingly severe duty is frequently acknowledged by switchgear designers in papers contributed by them to electrical engineering institutions and journals. We reproduce four references of this kind below.

Such acknowledgments are naturally gratifying to us and we shall hope to continue to contribute our quota to future developments in circuit-breaker design and construction.

"Interrupting contact faces are of Elkonite which is outstanding in its ability to withstand severe and repeated arcing with minimum loss of material."*

"Silver-tungsten (Elkonite) contacts were used for all moving and stationary members to positively prevent welding at 20,000 amperes or more. The use of this alloy reduces the burning of the contact material to a minimum."*

"As in the case of previous tests, the Elkonite-surfaced contacts showed practically no burning."*

"The secondary contacts consist of heavy copper fingers, surfaced on the burning area with a silver-tungsten alloy (Elkonite) to minimise deterioration and prolong the life of the entire stationary contact assembly."*

★ *These short extracts are taken from a detailed bibliography on arcing contacts in circuit-breaker design, giving full abstracts of papers published during the period 1933 to 1942, with particular reference to contact arrangements and materials. A limited number of copies of this bibliography are available, and may be obtained on request by designers and users of circuit-breakers.*

MALLORY

MALLORY METALLURGICAL PRODUCTS LTD.

An Associate Company of Johnson Matthey & Co. Ltd.

78 Hatton Garden, London, E.C.1. Telephone: HOLborn 6989

GD26

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange markets are busier now than they have been at any time this year—possibly at any time since the outbreak of war. They have their dramatic moments too. Violent rises in Argentine and other foreign railway stocks were abruptly checked by a disappointing report from the Central Argentine Railway. A minor slump followed. Anglo-Argentine Tramways, however, held their previous rises, and Brazilian Tractions spurted.

Gilt-edged issues maintained their ground: London Passenger Transport senior stocks are a point up. Panic is said to have attacked the Tokyo Stock Exchange, but Tokyo Electric sixes are 2 points better at 16½. The home industrial markets are fully supplied with business, and the predominance of buyers is reflected in a further long catalogue of price improvements. As a point of interest, it may be noticed that British Electric Traction deferred stock is now within a few points of £1,000.

Communications

Cable & Wireless ordinary are 10s. better at 70, showing a gain of nearly 5 points since the beginning of October. The preference keeps steady at 105½. Oriental Telephones went back to 55s. in spite of calculations that show the shares to be worth about 60s. on the assets of the company. Marconi Marines responded with 1s. rise to the announcement of the interim dividend of 2½ per cent., the same as before. International Telephone and Telegraph jumped from 4 to 6 upon a modest demand. Shares changed hands at 4¾ last Thursday. Telephone Properties ordinary at 13s. 6d. are 6d. harder on the recent report and accounts. Canadian Marconi went a shade better to 6s. 3d. in sympathy with the revived demand for Canadian issues. Radio shares remain a lively market. Pye deferred at 18s. 6d. are 6d. better, and others in this group continue to attract attention. Post-war prospects are quoted as offering temptation to the speculator, but it is generally assumed that most of the companies are at present fully occupied.

Security First

The comparatively modest return shown at the present rates of dividend on such shares as Henley's, Callender's, British Insulated, General Electric, etc., is sometimes explained by reference to expectation of dividends being increased. This impression is, however, liable to disappointment, so far as can be seen at present, for there is little immediate probability of dividend increases from most industrial companies, however substantial their profits may be. The incidence of E.P.T. is in itself sufficient to check the likelihood of dividends being raised in cases such as, and similar to, those quoted. The real reason for the strength of the prices resides in the confidence which investment places in the stability of the companies, and the assurance that post-war programmes will greatly expand. Many people put security first. They prefer low yields from shares in long-established companies with a fine record and a flourishing business, to the risks which have to be taken in order to obtain higher rates of income.

Manufacturing and Equipment

Following from this line of reasoning, it is natural to look for a consistent upward movement in the prices of ordinary shares in well-known industrial concerns. Once more, our price lists bear witness to the insatiable appetite of investment for securities of this nature. This week, in the equipment and manufacturing section, some two dozen rises go against a single fall: S. Smith 1s. shares have lost half the advance gained last week. Joseph Lucas ordinary at 73s. 9d. and Murex at 97s. 6d. are both half-a-crown up. General Electric put on 1s. 6d. to 85s., under pressure of buyers who look more to security than immediate yield. Falk, Stadelmann at 25s. and Ensign Lamps at 17s. 6d. are 1s. 3d. to the good. Electric & Musical ("Emmi") shares have recovered from the effects of disappointment with the dividend, and are 1s. 6d. higher at 17s. 9d. Callender's at 75s. are up 1s.; British Insulated moved up 1s. to 98s. Henley's regained the dividend deducted from the price last week; Crabtrees are good at 34s. ex dividend, the report being very satisfactory. Allen West hardened to 6s. upon buying attracted by the yield, and for a similar reason Thorn Electrics advanced to 18s. Strand Electrics are 3d. better at 5s.; the dividend has been increased from 4 to 7½ per cent.

Home Electricity

Discrimination is being applied to investment in shares of the Home electricity companies. Stock Exchange brokers find that their clients look closely at the difference of a few shillings per cent. in the yield offered by the ordinary shares of different companies. The trouble in this connection is that, although the shares in one company may show a better return than those of another, the available supply of the former may be extremely limited. Every now and then a reasonable line comes in, such, for instance as 10 000 Midland Counties Electric ordinary shares that were offered at 38s. 3d. On the 8 per cent. annual dividend paid by the company for the past few years the return at this price is £4 3s. 9d. per cent., dividends being payable in March and October. The line of 10,000

(*Concluded on page* 603)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Nov. 3	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	51/6	..	4 17 0
British Power and Light	6	6	27/-	..	4 9 0
City of London	7	7	27/-	..	5 3 8
Clyde Valley	8	8	40/-	..	4 0 0
County of London	8	8	39/-	+1/-	4 2 1
Edmundson's:					
7% Pref.	7	7	34/-	..	4 2 4
Ord.	6	6	28/-	..	4 5 9
Elec. Dis. Yorkshire	9	9	42/-	..	4 5 9
Elec. Fin. and Securities	12½	12½	49/-	..	5 2 1
Elec. Supply Corporation	10	10	44/6	+6d.	4 10 0
Isle of Thanet	2	Nil	13/-	..	—
Lancs. Light and Power	7½	7½	34/-	+1/-	4 8 3
Llanelly Elec.	5½	5½	22/6	..	4 17 9
Lond. Assoc. Electric	4½	4	19/-	+6d.	4 4 3
London Electric	6	6	24/6	..	4 18 0
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	37/6	+6d.	4 5 6
Midland Counties	8	8	38/6	+6d.	4 3 3
Mid. Elec. Power	9	9	41/6	..	4 6 9
Newcastle Elec.	7	7	30/-	..	4 13 5
North Eastern Elec. Ordinary	7	7	30/6	..	4 11 10
7% Pref.	7	7	33/6	..	4 3 7
Northampton	10	10	46/-	..	4 7 0
Notting Hill 6% Pref. (£10)	6	Nil	8¾	..	—
Northmet Power:					
Ordinary	7	7	36/6	+1/-	3 16 9
6% Pref.	6	6	30/-	..	4 0 0
Richmond Elec.	6	6	24/3	+6d.	—
Scottish Power	8	8	38/-	..	4 4 3
Southern Areas	5	5	21/-	..	4 15 3
South London	7	7	24/6	..	—
West Devon	5	5	22/6	..	4 9 0
West Glos.	4½	3½	19/6	..	3 11 9
Yorkshire Elec.	8	8	40/-	..	4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/6	+3d.	—
Calcutta Elec.	7*	7*	27/-xd	..	—
Cawnpore Elec.	10	10	26/-	..	7 13 10
East African Power	7	7	27/6	..	5 1 8
Jerusalem Elec.	7	5	20/6	..	4 17 7
Kalgoorlie (10/-)	7½	5	7/6	..	6 13 4
Madras Elec.	6*	4*	18/6	+1/-	4 6 6
Montreal Power	1½	1½	24	..	6 5 0
Palestine Elec. "A"	Nil	4*	27/-	+2/6	2 19 3
Perak Hydro-elec.	6	7	7/6	+1/-	—
Shawinigan Power	83cts.	90cts.	14¼xd	..	—
Tokyo Elec. 6%	6	6	16½	+2	—
Victoria Falls Power	15	15	77/6	+½	3 15 9
Whitehall Inv. Pref.	5	5	16/6	+6d.	6 1 3

Company	Dividend Previous	Dividend Last	Middle Price Nov. 3	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1955–60	—	3	99	..	3 0 7
1955–75	5	5	114	..	4 7 9
1951–73	4½	4½	107½	..	4 3 9
1963–93	3½	3½	103½	..	3 7 8
1974–94	3½	3½	99	..	3 5 4
London Elec. Trans. Ltd.	2½	2½	96	..	2 12 1
London & Home Counties 1955-75	4½	4½	109	..	4 2 7
Lond. Pass. Trans.:					
A	4½	4½	117½	+1	3 16 7
B	5	5	117½	+1	4 5 1
C	3	2¾	54	−1	5 6 8
West Midlands J.E.A. 1948–68	5	5	108	..	4 12 7
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	110	+½	5 9 1
Def.	1½	1½	26	..	5 15 5
Anglo-Portuguese	8	8	21/6	..	7 8 10
Cable & Wireless:					
5½ Pref.	5½	5½	105½	..	5 4 3
Ord.	4	4	70	+½	5 14 4
Canadian Marconi $1	Nil	4cts.	6/3	+3d.	2 15 0
Globe Tel. & Tel.:					
Ord.	8½*	5*	31/-	..	3 4 6
Pref.	6	6	28/-	..	4 5 9
Great Northern Tel.: (£10)	Nil	Nil	18½	+½	—
Inter. Tel. & Tel.	Nil	Nil	6	+2	—
Marconi-Marine	7½	7½	31/-	+1/-	4 16 9
Oriental Tel. Ord.	16	10	55/-	−6d.	3 12 9
Telephone Props.	6	Nil	13/6	+6d.	—
Tele. Rentals (5/-)	10	10	10/-	..	5 0 0
Traction and Transport					
Anglo Arg. Trans.:					
First Pref. (£5)	Nil	Nil	4/-	..	—
4% Inc.	Nil	Nil	10½	+1	—
Brit. Elec. Traction:					
Def. Ord.	45	45	985	+10	4 11 5
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8	10	46/3	..	4 6 6
Brazil Traction	8½	$1	18½	+1½	—
Calcutta Trams	8	5½	19/-	..	5 15 9
Cape Elec. Trams	5	5	23/-	+6d.	4 7 0
Lancs Transport	10	10	43/9	..	4 11 4
Mexican Light:					
1st Bonds	5	5	94½	+2	5 5 10
Rio 5% Bonds	5	5	99½	+1	5 1 0
Southern Rly.:					
5% Prefd.	5	5	74	−2	6 15 2
5% Pref.	5	5	109	+1	4 11 7
T. Tilling	10	10	50/-	+1/-	4 0 0
Tilling & B.A.	7*	6½*	57/6	..	2 5 3
West Riding	10	10	38/-	−1/-	5 5 3

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Nov. 3	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron Elec. Ord. ..	7½	10	32/– ..		6 5 0
Assoc. Elec. :					
Ord.	10	10	45/6 ..		4 8 0
Pref.	8	8	39/– ..		4 2 0
Automatic Tel.&El.	12½	12½	52/6 ..		4 15 3
Babcock & Wilcox	11	11	47/–xd..		4 13 7
British Aluminium	10	10	48/6	+3d.	4 2 6
British Insul. Ord.	20	20	98/–	+1/–	4 1 6
British Thermostat (5/–)	18½	18½	16/3 ..		5 13 10
British Vac. Cleaner (5/–)	10	15	18/–	+6d.	4 3 4
Brush Ord. (5/–) ..	Nil	6	6/6 ..		4 12 4
Callender's ..	15	15	75/–	+1/–	4 0 0
ChlorideElec.Storage	15	15	75/– ..		4 0 0
Cole, E. K. (5/–) ..	Nil	7	13/9	+3d.	2 11 0
Consolidated Signal	17	17	81/3 ..		4 3 9
Crabtree (10/–) ..	17½	17½	34/–xd	+6d.	5 3 0
Crompton Parkinson Ord. (5/–) ..	30	20	24/– ..		4 3 4
E.M.I. (10/–) ..	Nil	6	17/9	+1/6	3 7 7
Elec. Construction	10	10	34/6 ..		5 16 0
Enfield Cable Ord.	12½	12½	55/6	+1/–	4 10 9
Elecl. Switchgear (10/–)	10	10	20/– ..		5 0 0
English Electric ..	10	10	43/6	+6d.	4 12 0
Ensign Lamps (5/–)	25	25	17/6	+⅛	7 2 10
Ericsson Tel. (5/–)	22*	20*	41/3 ..		2 8 6
Ever Ready (5/–)	40	40	35/–	+6d.	5 14 3
Falk Stadelmann	7½	7½	25/–	+⅛	6 0 0
Ferranti Pref. ..	7	7	27/– ..		5 3 8
G.E.C. :					
Pref.	6½	6½	33/9 ..		3 17 0
Ord.	20	17½	85/–	+1/6	4 2 6
Greenwood & Batley	15	15	34/6 ..		8 13 10
Hall Telephone(10/–)	10	12½	21/3 ..		5 17 8
Henley's (5/–) ..	20	20	23/3xd..		4 6 0
4½% Pref. ..	4½	4½	23/– ..		3 18 5
Hopkinsons ..	15	15	54/6	+6d.	5 10 0
India Rubber Pref.	5½	5½	20/– ..		5 10 0
Intl. Combustion..	32½	30	112/6 ..		5 6 9
Johnson & Phillips	15	15	65/– ..		4 12 4
Lancashire Dynamo	20	20	73/9 ..		5 8 4
Laurence,Scott(5/–)	15	12½	10/– ..		6 5 0
London Elec. Wire	7½	7½	29/– ..		5 3 5
Lucas, J.	15	15	73/9	+½	4 1 7
Mather & Platt ..	10	10	45/– ..		4 9 0
Met.Elec.Cable Pref.	5½	5½	21/3 ..		5 3 6
Murex	20	20	97/6	+½	4 2 4
Pye Deferred (5/–)	25	25	18/6	+6d.	6 15 2
Revo (10/–) ..	20	17½	32/6 ..		5 7 8
Reyrolle	12½	12½	61/3 ..		4 1 7
Siemens Ord. ..	7½	7½	26/9	+3d.	5 12 3
Smith, S. (1/–) ..	50	37½	8/9	–6d.	4 5 9
Strand Elec. (5/–)	4	7½	5/–	+3d.	7 10 0
Switchgear & Cowans (5/–) ..	15	10	10/– ..		5 0 0
T.C.C. (10/–) ..	5	5	15/– ..		3 6 8
T.C. & M... ..	10	10	44/6 ..		4 10 0
Telephone Mfg.(5/–)	9	9	10/6	+3d.	4 5 10
Thorn Elec. (5/–). .	20	20	18/–	+6d.	5 11 1
Tube Investments	23½	20	90/–	+1/–	4 9 0
Vactric (5/–) ..	Nil	Nil	8/–	+6d.	—
Vickers (10/–) ..	10	10	18/3 ..		5 9 7
Ward & Goldstone (5/-)	20	20	20/– ..		5 0 0
Westinghouse Brake	10	10	52/6	+⅛	3 16 0
Walsall Conduits(4/–)55		55	38/9 ..		5 13 4
West, Allen (5/–)..	7½	7½	6/–	+3d.	6 5 0

* Dividends are paid free of Income Tax.

Stocks & Shares (*Continued from page* 601)

shares is almost certain to have been taken before this issue of the *Electrical Review* is published, but possibly there may remain some of the 2,500 Scottish Power ordinary shares that came on offer at the same time and at the same price. The market is a rising one, with gains marked against County of London, Lancashire, Northmets, Metropolitan, Richmond and others.

Yields Compared

By comparison with some of the others in the Home Group, Northmet Power ordinary shares at 36s. 6d. giving £3 16s. 9d. per cent. on the money, look expensive. Electric Supply Corporation ordinary shares, on offer at 45s., give £4 8s. 9d. per cent. Richmond (Surrey) ordinary shares received 6 per cent. dividend in each of the past three years, but the interim dividend was passed last March and it remains to be seen whether the 6 per cent. will be repeated for the present full year. At 25s., 500 shares can be bought that will return, if the 6 per cent. is maintained, £4 16s. per cent. By comparison with these the yield of £4 13s. 5d. on Newcastle & District Electric Lighting ordinary shares at 30s. looks attractive.

Brazil and Mexico

A smart recovery in the price of Brazilian Traction shares carried the quotation to 18½. The impetus came from speculative buying of almost anything Brazilian on the theory that Brazil is fully sharing in the greater prosperity that is to-day enjoyed by the South American countries. Moreover, with the exchange position so considerably altered for the better, the company should be able to distribute an increased dividend in the near future. There is still a fair market in the shares on this side, and the substantial improvements which have occurred in foreign railway issues serve to direct attention to Brazilian Tractions, as much on account of their present-day position as of the company's post-war prospects.

Mexicans are also in brisk demand. Government, railway, utility and mining shares connected with Mexico have come into the limelight of public interest. Mexican Light 5 per cent. bonds are again 2 points up, at 94½, a rise of 20 since the beginning of this year.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *can be obtained from the Patent Office*, 25, *Southampton Buildings, London, W.C.*2.

1939

20472. "Electrical frequency filter arrangement." Telefonaktiebolaget L. M. Ericsson. July 13th, 1938. (Cognate application, 20473/39.) (548299.)

1940

6044. "Gyroscopes." S. Smith & Sons (Motor Accessories), Ltd., and H. E. Whatley. April 3rd, 1940. (548376.)

1941

2278. "Signal collecting systems for radio receivers and the like." Johnson Laboratories, Inc. February 19th, 1940. (548301.)

2858. "Means for reducing the induced voltage when an inductive circuit is interrupted." Igranic Electric Co., Ltd., and C. E. Randall. March 3rd, 1941. (548345.)

2861. "High-frequency electron discharge apparatus." British Thomson-Houston Co., Ltd. March 1st, 1940. (548346.)

3017. "Electric welding, soldering and fusing together of metal and other parts." A. Rakos. March 5th, 1941. (548350.)

3030. "Electric regulators of the carbon pile type." J. Stone & Co., Ltd. and L. R. Nixon. March 5th, 1941. (548388.)

3106. "Balancing arrangements for electricity supply in telegraph and other systems." Standard Telephones & Cables, Ltd., V. J. Terry and T. F. S. Hargreaves. March 7th, 1941. (548419.)

3129. "Electric motor control systems." General Electric Co., Ltd., and E. H. Croft. March 7th, 1941. (548420.)

3181. "Machine for electric welding." British Federal Welder & Machine Co., Ltd., and A. G. Galle. March 8th, 1941. (Cognate application, 3721/42.) (548453.)

3252. "Television broadcast system." Hazeltine Corporation. April 6th, 1940. (548421.)

4308. "Electrical apparatus, *e.g.*, electric transformers." C. A. Parsons & Co., Ltd., and E. C. Rippon. March 31st, 1941. (548305.)

4378. "Formation of reflecting surfaces on glass." Siemens Electric Lamps & Supplies, Ltd., J. N. Aldington and A. J. Meadowcroft. April 1st, 1941. (548353.)

4417/4420. "Enclosed electric switchgear." A. Reyrolle & Co., Ltd., A. Allen and J. Christie. April 2nd, 1941. (548306/548307.)

4462. "Method and apparatus for regulating an installation comprising at least two steam generators." Sulzer Frères Soc. Anon. April 6th, 1940. (548309.)

4483. "Machines having electrically heated elements and electrically driven work conveying means." Projectile & Engineering Co., Ltd., F. G. Clark and K. E. Morford. April 3rd, 1941. (548311.)

4536. "Arrangement for the reproduction of sound." O. K. Kolb and D. W. Boston. April 4th, 1941. (Addition to 473256.) (548357.)

4613. "Thermionic valve amplifiers." Standard Telephones & Cables, Ltd., and M. M. Levy. April 7th, 1941. (548424.)

4664. "Electrically operated suction cleaners." Hoover, Ltd. April 18th, 1940. (548456.)

4713. "Electric warning lights." Simmonds Development Corporation, Ltd. April 13th, 1940. (548362.)

5051. "Gas-filled electric-discharge device." Standard Telephones & Cables, Ltd. April 24th, 1940. (548392.)

5311. "Sound recording systems." Radio Corporation of America. December 29th, 1939. (548460.)

5398. "Magnetic cores and the production thereof." Telephone Manufacturing Co., Ltd., and L. H. Paddle. April 25th, 1941. (548461.)

5713. "Beam deflecting circuits for cathode-ray tubes." British Thomson-Houston Co., Ltd. May 3rd, 1940. (548463.)

5732. "Electric hand torches." G. F. J. Dandridge and W. & E. Kupfer, Ltd. May 2nd, 1941. (548324.)

5818. "Starting systems for electric motors." R. Clarke and G. J. Scott. May 5th, 1941. (548326.)

6504. "Electric transformers." British Thomson-Houston Co., Ltd. May 24th, 1940. (548394.)

6818. "Means for operating an electric switch through a partition, wall or the like." Contactor Switchgear, Ltd., and C. A. Bradbury. May 28th, 1941. (548466.)

6946. "Method of and apparatus for the heat-treatment of rubber and other plastics, and other materials which are relatively poor conductors." Okonite Co. May 31st, 1940. (548336.)

6969. "Photo-sensitive electrodes." Marconi's Wireless Telegraph Co., Ltd. June 1st. 1940. (548337.)

6971. "Frequency modulation." Marconi's Wireless Telegraph Co., Ltd. May 31st, 1940. (548370.)

7028. "Apparatus for converting a direct voltage into a frequency proportional thereto." W. W. Triggs (Akt.-Ges. Brown, Boveri & Cie.) June 3rd, 1941. (548396.)

7076. "Electricity conductor unit." L. G. Morten and J. F. O'Brien. June 4th, 1941. (548373.)

7248. "Means for receiving electrically transmitted measurements." Landis & Gyr Soc. Anon. May 22nd, 1940. (548402.)

7500. "Relay." Standard Telephones & Cables, Ltd. June 27th, 1940. (548467.)

7510. "Electric circuit arrangements for reducing the variations in the starting potential of gaseous electric-discharge devices." M. A. Claesson. June 15th, 1940. (548405.)

7702. "Detachable connections for supporting or suspending electric light fittings and for other purposes." British Thomson-Houston Co., Ltd., E. R. Edinborough and W. C. Huston. June 18th, 1941. (548408.)

8205. "Windings of electrical machines having commutators." Lancashire Dynamo & Crypto, Ltd., and W. Stansfield. June 30th, 1941. (548412.)

8254. "Electric heating appliances." C. L. Grimwood. July 1st, 1941. (548413.)
8362. "Electrolytic cells." C. N. Richardson. July 2nd, 1941. (548428.)
8474. "Electric frequency meters." British Thomson-Houston Co., Ltd. July 6th, 1940. (548431.)
8737. "Operating mechanism for circuit-breakers." British Thomson-Houston Co., Ltd. July 11th, 1940. (548438.)
8982. "Frequency converters." Telephone Manufacturing Co., Ltd., L. H. Paddle and B. Drake. July 16th, 1941. (548441.)
8987. "Machines for spinning metals." British Thomson-Houston Co., Ltd. July 16th, 1940. (548442.)
8996. "Television and like transmission." Marconi's Wireless Telegraph Co., Ltd. July 17th, 1940. (548443.)
9042. "Electric switch bodies and the arrangement of electric conductors therein." J. F. O'Brien. August 27th, 1940. (548470.)
9050. "Gas-blast electric circuit-breakers." British Thomson-Houston Co., Ltd. July 17th, 1940. (548444.)
9118. "Electro-magnetic relays." Landis & Gyr Soc. Anon. July 20th, 1940. (548445.)
9172. "Electrical indicating instruments." Simmonds Development Corporation, Ltd. August 23rd, 1940. (548447.)
9469. "Electric circuit-breakers having magnetic blow-outs." Chance Bros. & Co., Ltd., and N. W. Bertenshaw. July 25th, 1941. (548472.)
9520. "Four-wire terminating arrangements in electrical communication systems." Standard Telephones & Cables, Ltd. (International Standard Electric Corporation). July 26th, 1941. (548473.)
9983. "Over-voltage protection devices." Allmanna Svenska Elektriska Aktiebolaget and G. Rydbeck. August 6th, 1941. (548477.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Edinburgh.—November 9th. Gas Department. Electrically driven centrifugal pump (5,000 gal. per hr.), with switchgear, for gas works. Specifications, etc., from the engineer and manager, Corporation Gas Department, 15, Calton Hill.

Glasgow.—Corporation Gas Committee. Pumps and electric motors for boiler feed system at gas works.

South Africa.—SALISBURY (S. RHODESIA).—November 30th. City Council. Cable and accessories. (October 30th.)
December 7th. City Council. Coal-handling plant. (See this issue.)

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Dining centres at three schools; J. A. Ogg Allan, architect, 73-79A, Union Street, Aberdeen.

Birkenhead.—Extensions, Mersey Mission to Seamen; trustees.

Birmingham.—Sleeping quarters for nurses; F. H. C. Wiltshire, town clerk, The Council House.
Residential nursery, Wassell Grove, Hagley; H. J. Manzoni, city engineer, Council House.

Bolton.—Canteen and painting shed, Manchester Road; Pilot Works, Ltd.
Canteen, St. John Street; T. Caldwell & Son.
Canteen, Atlas Forge, Bridgeman Street; T. Walmsley & Sons, Ltd.

Brayton.—War Memorial Institute; secretary, Village Hall Committee, Brayton, near Selby, Yorks.

Cumberland.—Repairs to Silloth School (£1,200) and school canteens at Ivegill, Dalston, Dovenby, Waberthwaite, Braithwaite and Bassenthwaite; county architect, Carlisle.

Derbyshire.—Canteen and dining room, secondary school, Ilkeston; J. Harrison, county architect.

Droitwich.—Electric wiring and lighting installation at the Town Hall; R. E. Hulse, borough surveyor.

Dudley.—Control rooms and shelters at N.F.S. stations; F. H. Gibbons, borough engineer, Council House.

Durham.—Wartime nurseries at Coundon and West Cornforth (£930); county architect, 34, Old Elvet, Durham.

Easington.—British Restaurant at Deaf Hill; C. W. Clarke, surveyor, Rural District Council offices, Easington, Co. Durham.

Eccles.—Two restaurants, Lane End and Liverpool Road; borough engineer.

Farnborough (Hants).—British Restaurant, Victoria Road (£2,347) for U.D.C.; W. J. Rumble, builder, Rectory Road.

Glasgow.—Wireless workshop and store-room, Central Police office (£2,500); city engineer.
Garages for National Fire Service; City architect.

Guildford.—Workshops, Epsom Road; P. H. Gillingham.

Halifax.—Communal kitchen and two huts ments for restaurant; D. T. Lloyd Jones, borough engineer, Crossley Street.

Ilford.—Foundry; F. Meredith.
Works extensions; H. Hughes & Sons, Ltd.

Kirkcaldy.—British Restaurant (electrical work); Burgh Chamberlain, Osborn House.

Leicester.—Improvements, Cattle Market (£4,800); J. L. Beckett, city surveyor, Town Hall.

Leicestershire. — Day nurseries at Sileby, Syston, Lutterworth, Castle Donington and Wigston Magna; county architect, Leicester.

Leigh.—Wartime nursery, Stone House; T. A. Clare, borough surveyor, Town Hall.

London. — CAMBERWELL. — Nursery, Lowth Road (£1,709); J. W. Ashdown, Ltd.

ST. PANCRAS.—Canteen, Hawley Crescent; Henly's, Ltd.

WOOLWICH.—Completion of 144 houses, Woodlands estate, Plumstead; borough engineer.

Luton.—Conversion of premises for use as girls' hostel (£4,000); F. Oliver, borough engineer, Town Hall.

Manchester.—Wartime nursery, Miles Platting (£2,800); G. Noel Hill, city architect, Town Hall, Albert Square, Manchester 2.

Melton Mowbray.—Houses; W. H. Jarvis, surveyor, Council offices.

Middlesbrough.—Huts at the Beechwood, Whinney Banks and Tranter Road Schools; education architect.

Newbury.—British Restaurant, Northcroft; borough surveyor, Municipal Buildings.

Newcastle-on-Tyne.—Additional classroom at the Edgefield School and school canteens to serve half school population; education architect, Northumberland Road, Newcastle.

Newcastle-under-Lyme.—Completion of houses; A. Cotton, borough surveyor, Municipal Offices.

Extensions to cold storage accommodation, Porthill; S. Morrey, dairyman, 18, Queen Street.

Additions, Cheapside, High Street; Carryers Bros., Ltd., furnishers, Friar Street.

Norwich.—Huts for six classrooms, Thorpe Hamlet Primary School (£1,650); borough surveyor, City Hall.

Ossett.—Restaurant, Wesley Street; borough engineer.

Perth.—Extensions; J. Pullar & Sons, Ltd.

Richmond (Yorks).—Adaptation of chapel as offices and council chamber for the R.D.C.; surveyor.

Salford.—Conversion of Methodist Church, Seedley, for use as British Restaurant; W. A. Walker, city engineer, Town Hall, Bexley Square.

Salop. — Huts for school accommodation (£4,200); A. G. Chant, county architect, 5, Belmont, Shrewsbury.

Scarborough.—Sleeping quarters at Seamer Road; F. Baker, architect, York Place, Scarborough.

Sheffield.—Remand home; city engineer.

Southgate.—Fire station, Town Hall depot (£1,044); A. Scott & Sons, Ltd.

Stoke-on-Trent.—Church; secretary, Diocesan Committee, Church House, Lichfield.

Sunderland.—British Restaurants at Ford, Hylton and Tunstall; R.D.C. surveyor, 1, Esplanade, Sunderland.

Surrey.—Central kitchen, Horley, with lighting work, etc. (£2,755); county architect, County Hall, Kingston-on-Thames.

Warrington.—Nurseries; W. Peak, builder, 17, Church Street, and Wright Bros., builders, "Denbury," Manchester Road, Stockton Heath, Warrington.

West Riding.—Fifty wartime nurseries and school canteen, Modern School, Bingley; H. Wormald, county education architect, county Hall, Wakefield.

Whitehaven.—Control room for N.F.S.; T. C. Bone, clerk to Joint Fire Services Committee, Town Hall.

Wolverhampton.—Rebuilding warehouse, Williamson Street; A. M. Griffiths & Son.

Wokingham.—British Restaurant; R. R. Hole, borough surveyor, Town Hall.

Wood Green.—Restaurant, High Road; borough engineer.

Worcestershire.—School canteen, Barnt Green; H. Rowe & Son, county architects, 38, Foregate Street, Worcester.

TRADE MARK APPLICATIONS

RECENT applications for British trade marks include the following, objections against which may be entered within a month of the dates stated:—

October 21st.

TANNOY. No. 619,700, Class 9. Electric signalling and alarm apparatus, telephone systems and apparatus, television apparatus, radio apparatus, and parts (not included in other classes); sound recording, reproducing and amplifying instruments and apparatus; photo-electric apparatus; electric oscillation generators; sound generators; respirators and acoustic apparatus therefor; electric conductors; electric switches; electric batteries and accumulators; testing apparatus for acoustic and electrical instruments and apparatus. —Guy R. Fountain, Ltd., Tannoy Works, Canterbury Grove, West Norwood, London, S.E.27. To be associated with No. 488,958 (2612) viii.

October 28th.

SKYLUX. No. 618,661, Class 7. Pipe and cable laying machines; tube, bar and rod bending machinery, etc.—Skylux, Ltd., 30, Brunel Road, Old Oak Common Lane, Acton, London, W.3.

PIGENAM. No. 619,726, Class 9. Wire for electrical purposes.—Pirelli-General Cable Works, Ltd., 343-5, Euston Road, London, N.W.1.

ELKONITE. No. 619,854, Class 9. Electrical contacts; and MALLOSIL, No. 619,855, Class 9. Electric contact devices, and parts thereof not included in other classes, and electrical contacts.—Mallory Metallurgical Products, Ltd., 78, Hatton Garden, London, E.C.1.

STRATOSIL. No. 620,269, Class 9. Vibrators, being parts of electrical apparatus not for surgical or curative purposes.—Wright & Weaire, Ltd., 740, High Road, Tottenham, London, N.17.

MAZDALUX. No. 619,111, Class 11. Electric light fittings.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2. (To be associated with No. 320,085 (1,676) xiii and others).

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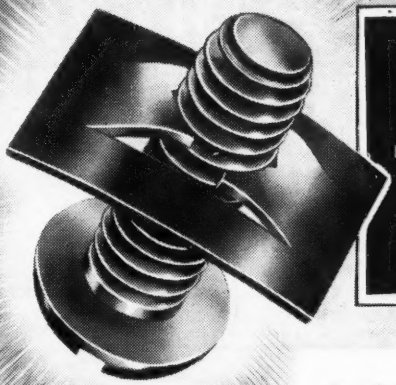

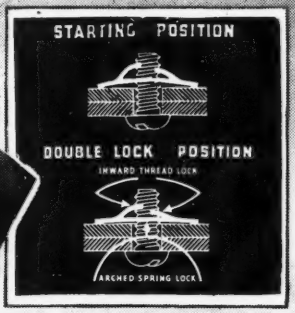

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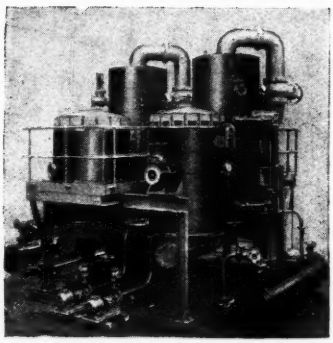

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A Tribute to the War-Workers of the Nation.

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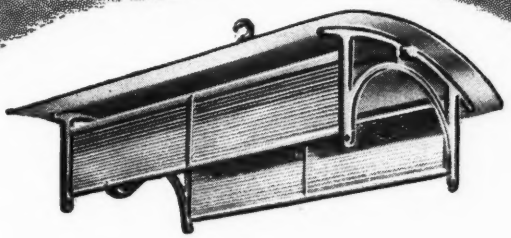

THE "Duo-Beam" embodies a system of industrial lighting, based on principles already proved in street lighting. The refractor plates being of a special design, ensure entire freedom from glare. The distribution is in two parts, the main distribution being 38° below the horizontal, the other in an upward direction on to a vitreous enamelled reflector and thence reflected on to the working plane. This system ensures the fullest possible use of the light from the Sodium or Mercury Discharge Lamp for industrial lighting. Full particulars submitted and illuminating schemes prepared upon request.

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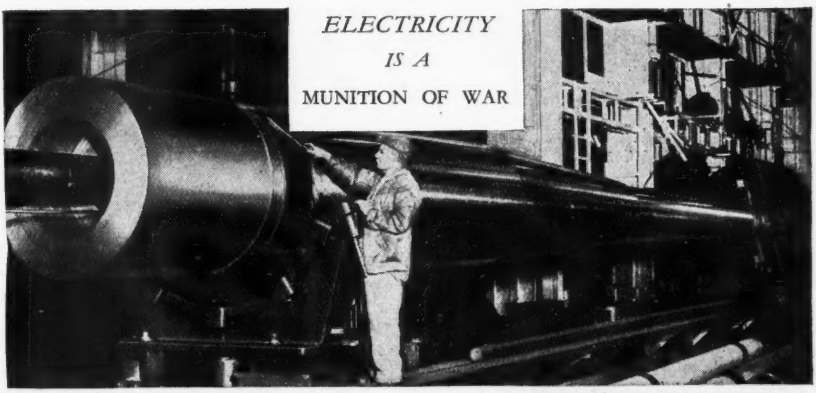

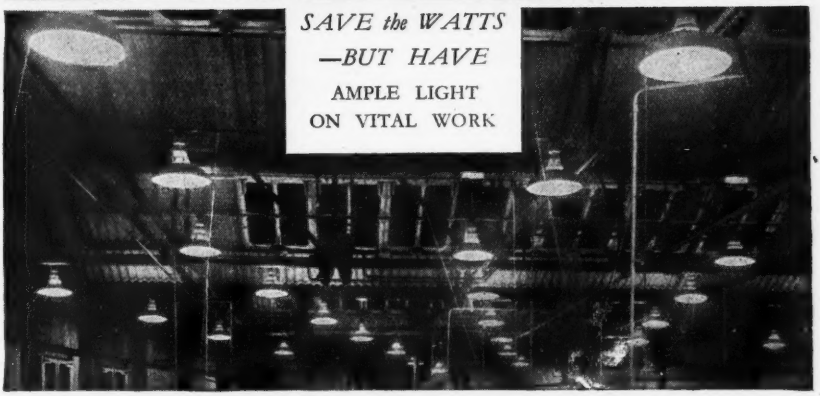

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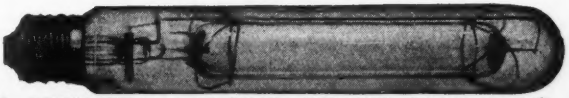

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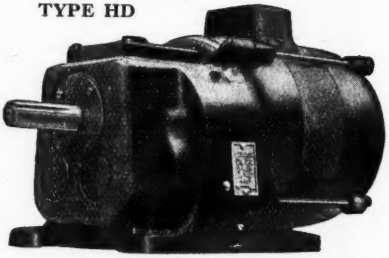

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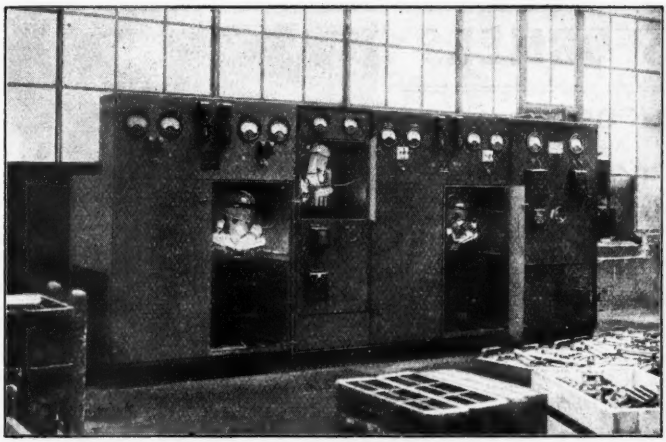

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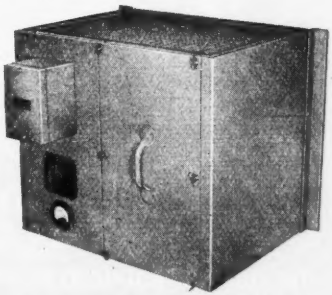

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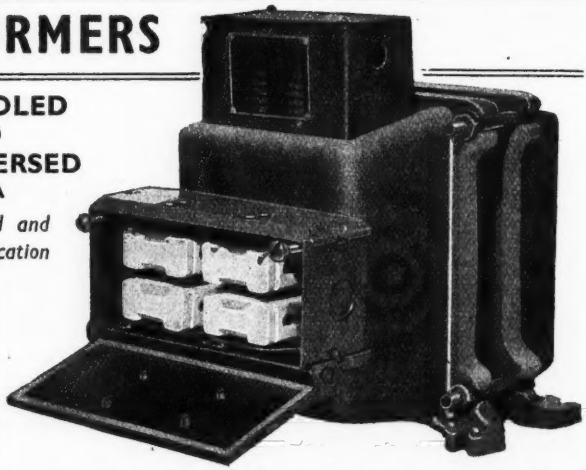

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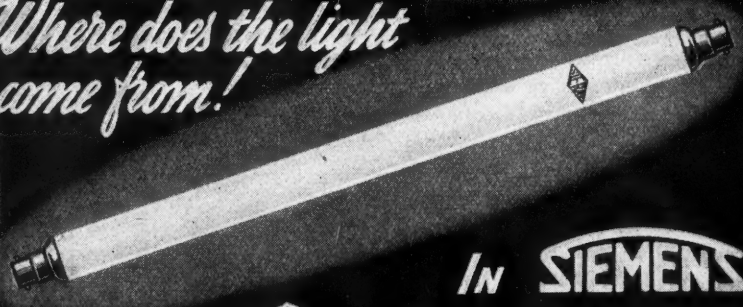

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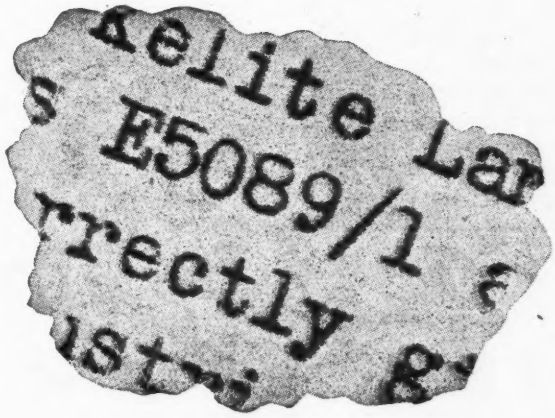

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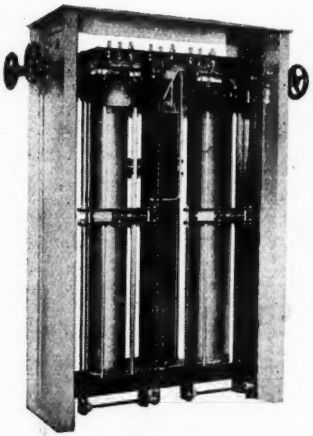

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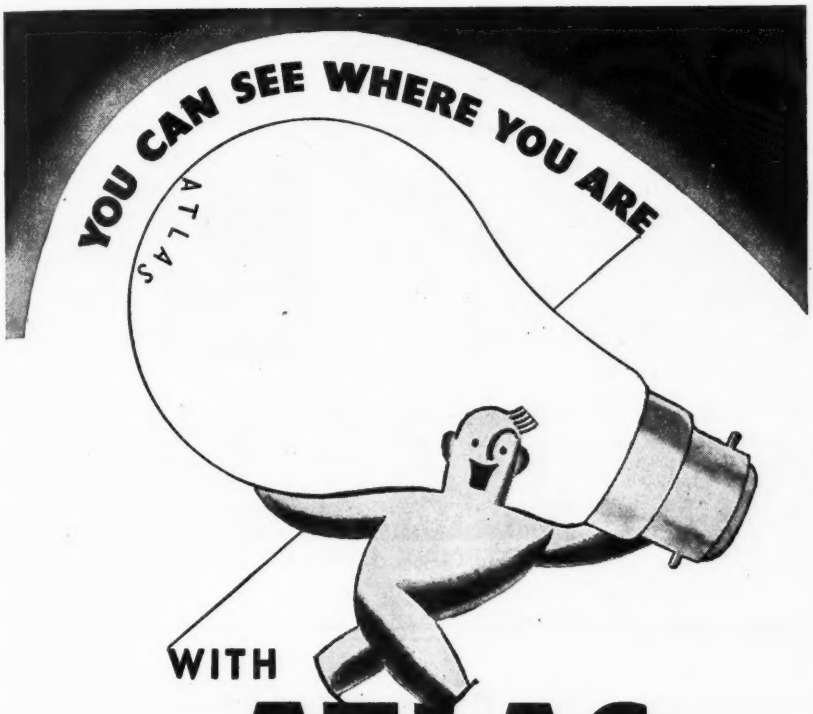

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ATLAS LAMPS

You don't have to take chances because every Atlas Lamp goes through such rigid tests at the factory, just as exacting now as in peace time, that you can sell them with confidence. Very large users — who can and do keep accurate tests of lamp performance — buy more Atlas Lamps than any other single make. You make more profit by selling Atlas. Ask for our current terms.

THORN ELECTRICAL INDUSTRIES LTD., ATLAS LAMPS DIVISION, 105-109 JUDD STREET, LONDON, W.C.1.
Telephone: Euston 1183 (7 lines) Telegrams: "Eleclampo, Kincross, London."

Northern Branch: 55 Blossom St., Manchester. 'Phone: Central 7461-2-3. 'Grams: "Eleclampo, Manchester."
North Eastern Depot: 46 Sandhill, Newcastle-on-Tyne 1. 'Phone: Newcastle 24068-9. 'Grams: "Macu, Newcastle-on-Tyne."
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FIRE cannot harm PYROTENAX Cable

1. *After bending at right angles, and flattening in a vice, successfully withstood consecutive pressure tests of 4 kV without breakdown.*
2. *After flattening to less than* $\frac{1}{4}$" *thickness insulation still preserved between conductors and conductors and sheath.*
3. *Flattened and doubled without diminution of electrical properties.*

FOR reasons of safety and reliability, and he ease with which it can be installed, Pyrotenax Mineral Insulated Cable is being specified for an increasing number of Power Station and Sub-station installations for the leading supply Companies, and Industrial Organisations in Great Britain and the British Empire.

In addition to its complete fireproof properties it is also unaffected by oil, industrial atmospheres and condensation.

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The Makers of "*Tank*" *Brand* Non-Ferrous Metal Alloys, including :— Extruded Brass and Bronze Rods and Sections, Brass and Bronze Stampings, Gun Metal and Phosphor Bronze Ingots, Chill Cast Gunmetal and Phosphor Bronze Bars and Terne Metal and Cupro Nickel Ingots and Granules, regret their inability to satisfy all the requirements of clients for their products for the time being.

However, the complete satisfaction of clients, old and new, is their chief concern, and when Peace returns to the World again, they will strive to satisfy all, and prove to new friends that their products are second to none. They are grateful for the understanding and forbearance already shown to them in these difficult times.

MINISTRY OF SUPPLY

NON-FERROUS METALS are URGENTLY NEEDED

Upon them largely depend the accuracy, deadliness and efficiency of Britain's instruments of war. Practically all of them have to be imported across thousands of miles of dangerous seas, making heavy demands on shipping space.

Make a clean sweep of your unwanted COPPER, ZINC, LEAD, PEWTER, WHITE METAL BRASS AND BRONZE, ALUMINIUM SCRAP

The need for vast and increasing quantities of these metals must be met by a national search for everything made from them which is broken or serving no useful purpose.

WHAT TO SEARCH FOR

Here is a list of some of the important non-ferrous metal articles, parts and equipment likely to be found on your premises. Use it as a guide to your search for everything you can spare.

COPPER — cable, electrical parts and fittings, sheathing, tube, turnings, wire.
ZINC — sheet, cuttings.
LEAD — covered cable, pipe, sheet, solder.
WHITE METAL — anti-friction metal, plumbers' jointings, solder waste.
BRASS — pipe, sheet, tube, turnings.
BRONZE — bearings, bushes, cocks, couplings, crown wheels, junction boxes, unions, valves.
ALUMINIUM SCRAP (and its alloys) — pipe, sheet, castings, tube, turnings.

HOW TO DISPOSE OF IT

1 Sell your non-ferrous scrap to a Merchant.
2 Or hand it in to a Local Authority Depot.
3 SPECIAL COLLECTIONS of amounts over ONE TON may be obtained by getting in touch with the nearest Demolition and Recovery Officer. If you don't know his name, write to The Ministry of Works & Planning, Lambeth Bridge House, London, S.E.1.

NOTE: Under the provisions of the Scrap Metal (No. 2) Order, 1942, if you are in possession of more than 3 tons of Scrap Metal, it is now an offence not to disclose the fact to The Ministry of Works & Planning, Lambeth Bridge House, London, S.E.1.

WANTED! INDUSTRIAL SALVAGE STEWARDS

Salvage is of such great and increasing importance that it should be made the personal responsibility of one particular individual in the various departments of every organisation. Appoint your own Industrial Salvage Stewards. Put them in sole charge of an intensive drive for

STILL MORE PAPER, RUBBER, RAGS, BONES, KITCHEN WASTE—AND METAL

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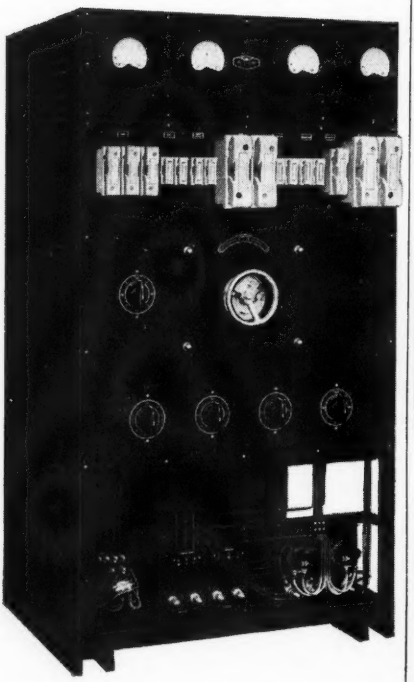

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FOR ALL PURPOSES

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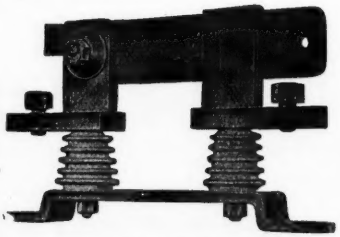

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500 to 2,000 volts, 50 to 3,000 amps.

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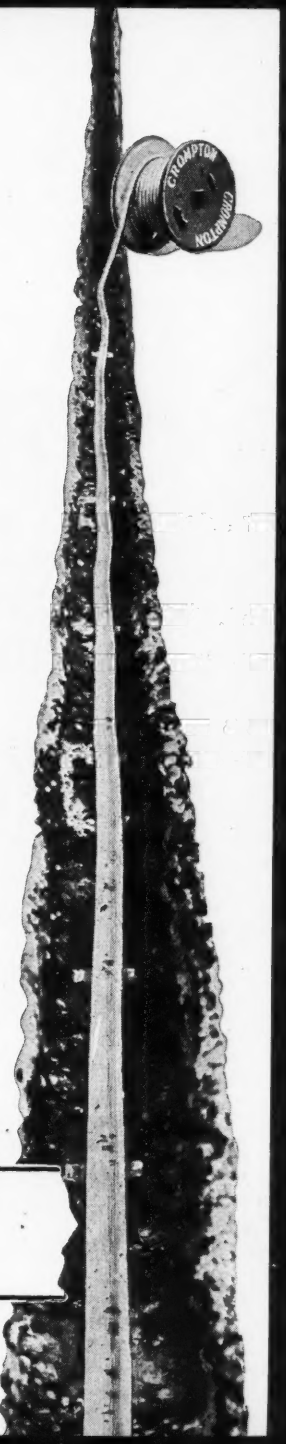

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